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Inside

PC Magazine has thrived in a competitive industry, largely because it has defined its role better than any other magazine that covers the personal computer field. Our mission has been summed up by a single mathematical equation: $PC = (EP)^2 + I$. The formula, created by editor and publishing director Bill Machrone, stands for Evaluating Products and Enhancing Productivity, with Insight.

To this end, *PC Magazine* was the first computer publication to develop a testing laboratory, and the work performed within PC Labs is at the heart of everything we do. Standing behind all the benchmark testing, hands-on product evaluations, and script development for our comparative features roundups is Bob Kane, PC Labs' technical director.

Bob Kane, technical director of PC Magazine Labs, keeps watch over the development and continued integrity of our benchmark tests.

Kane's value is reaffirmed daily; his guidance to editors and reviewers helps to ensure the continued development of technical prowess among the editorial staff. As technical director, Kane supervises the ongoing development of *PC Magazine* benchmark tests and testing scripts. Through communication with the engineers and product managers, he and the other Labs' staff help sort out the conflicts and incompatibilities that highlight the product development cycle of our industry.

Kane joined *PC Magazine* four years ago after a successful stint at an independent computer retail outlet, where he managed the service center. There he sold and supported a wide range of PC equipment, including products from the blossoming third-party PC-compatible market.

With this experience under his belt, Kane joined PC Labs in 1987, first working as a system support specialist, followed then by a two-year stint as the project leader for all hardware-related stories. Among his responsibilities were the maintenance of the Labs' original *VINES* network, the later conversion over to *NetWare*, and the testing and evaluation of hundreds of PCs, video adapters, printers, graphics packages, and much more.

(When he is not wearing his many hats inside PC Labs, Kane might be spotted in dark sunglasses and a New York Rangers cap, sneaking across 33rd Street to watch the Broadway Blues battling NHL foes on the ice of Madison Square Garden.)

In this issue, PC Labs examines 14 new small-footprint 25-MHz 386 PCs using the latest revision to our suite of benchmark tests, Version 5.6. Also, contributing editor Richard Hale Shaw takes an in-depth look at another revision, Version 1.1 of *dBASE IV*. Find out whether Ashton-Tate is back on track with the latest release of its popular yet problematic database.

—Matthew J. Ross ■

PHOTOGRAPHY: THOM O'CONNOR

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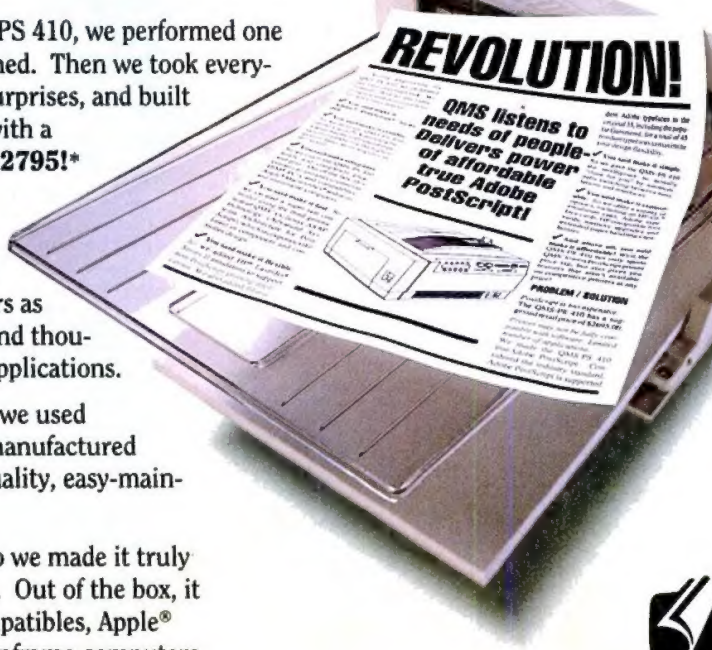

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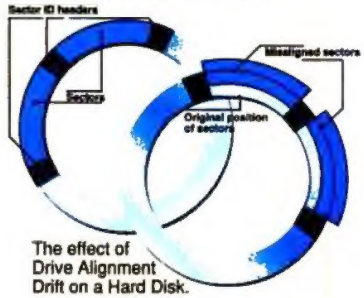

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Except where noted: All *PC Magazine* reviews are of currently available products. Comparative reviews are arranged alphabetically by product name for software, by company name for hardware. Software is free from copy protection. On benchmark test charts, shorter bars indicate faster products (less time to complete a task). Benchmark and performance tests are run on Compaq 386/25s.

HIGHLIGHTS

- 80C286 12MHz Microprocessor
- 6 lbs. Total Weight
- 1Mb RAM (expands to 3Mb on system board)
- 20Mb Hard Disk Drive
- 1.44Mb Floppy Disk Drive
- Pre-Loaded with MS-DOS 4.01
- Slim 2" Notebook Size
- Up to 4 Hours Operation Time
- Battery & Recharger Included

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HIGHLIGHTS

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- 6 lbs. Total Weight
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- 1.44Mb Floppy Disk Drive
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KEYBOARD

- 82 Key Keyboard
- Full-Sized Embedded Numeric Pad with 12 Function Keys

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- Brilliant 10" VGA Diagonal Display with 640 X 480 Resolution

OPERATION FEATURES

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- Video/Audio Low-Battery Warning Indicator
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HIGHLIGHTS

- 80386/DX Intel 25MHz Microprocessor
- 2Mb RAM (expands to 8Mb on system board)
- 125Mb Super-Fast IDE Hard Drive with 32K Cache
- 14" Austin High Clarity VGA Color Monitor
- Super-Charged VGA Video Adapter (supports up to 1Mb VRAM)
- Pre-Loaded with Microsoft Windows 3.0 and MS-DOS 4.01
- Microsoft Mouse
- Complete System for only $2890!

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AUSTIN 386/25 WINSTATION

STANDARD FEATURES

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- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 80387 Math Coprocessor Socket
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Small Footprint Chassis
- Compatible with DOS, OS/2, and Unix

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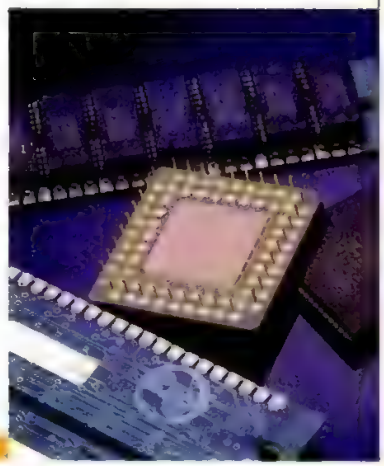

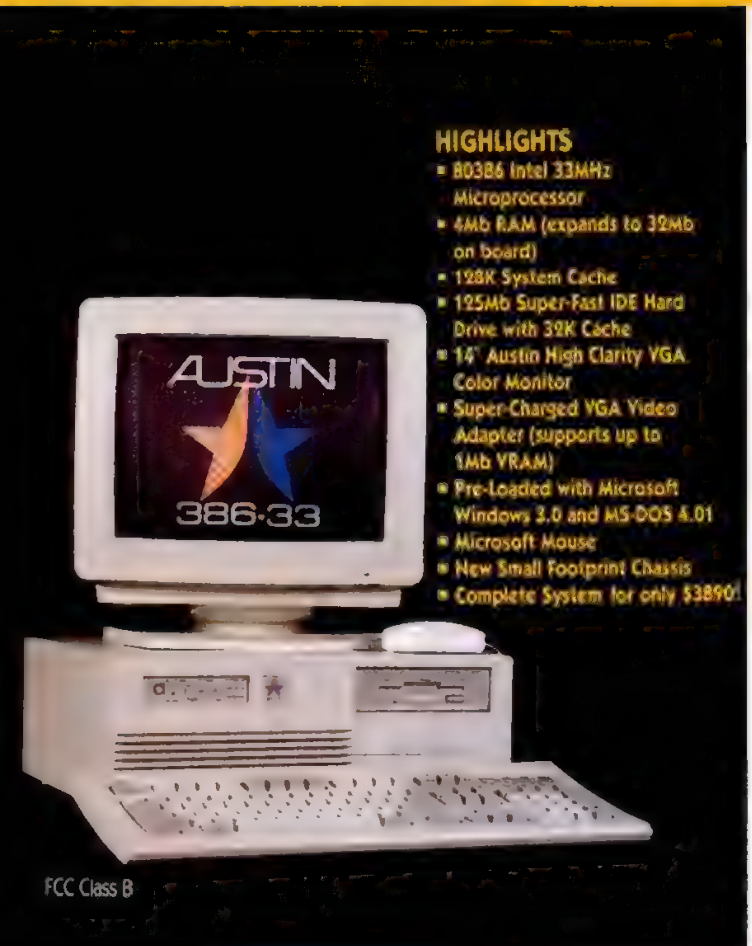

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HIGHLIGHTS

- 80386 Intel 33MHz Microprocessor
- 4Mb RAM (expands to 32Mb on board)
- 128K System Cache
- 125Mb Super-Fast IDE Hard Drive with 32K Cache
- 14" Austin High Clarity VGA Color Monitor
- Super-Charged VGA Video Adapter (supports up to 1Mb VRAM)
- Pre-Loaded with Microsoft Windows 3.0 and MS-DOS 4.01
- Microsoft Mouse
- New Small Footprint Chassis
- Complete System for only $3890!

AUSTIN 386/33 WINSTATION

STANDARD FEATURES

- Floppy Drive (1.44Mb or 1.2Mb)
- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- Intel 80387 or Weitek 3167 Math Coprocessor Socket
- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Compatible with DOS, OS/2, and Unix

Complete VGA Color System with 125Mb Hard Drive, 4Mb RAM, and GE On-Site Service... **$3890** Just $117 Mo.!

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Want to go incredibly fast? The Austin 386/33 will show you how fast *fast* can be. With its 4Mb RAM, 125Mb hard drive with 32K cache, and 128K system cache...you'll speed through everything. But don't just take our word. Deskdrive it!

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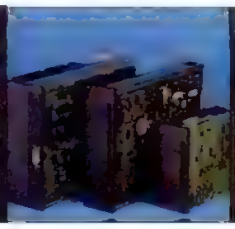
Austin's large selection of hard drives gives you what you need most...all the right options for storage capacity and seek time. We have IDE and ESDI, ranging from 40Mb to 1.2Gb.



Real power doesn't have to be expensive. The Austin 486/25 proves it with extra high-powered features...like EISA bus architecture, 4Mb RAM, and 125Mb hard drive. And plenty of CAD and fileserver options. All for under $6000!

Power Up With Austin.

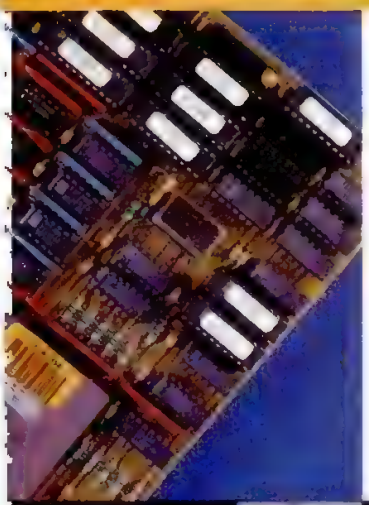
HIGHLIGHTS
- 1486 Intel 25MHz Processor
- EISA Bus Architecture
- 4Mb RAM (expands to 64Mb on system board)
- Internal 8K Cache and Floating Point Unit
- Additional 64K External Cache (expands to 256K on system board)
- 125Mb Super-Fast Hard Drive with 32K Cache
- 14" Austin High Clarity VGA Color Monitor
- Super-Charged VGA Video Adapter (supports 1Mb VRAM)
- Landmark v1.14 Rating-113.8MHz
- Complete System only $5990!

AUSTIN 486/25 WINSTATION

STANDARD FEATURES
- 8 32-bit EISA/ISA Compatible Slots
- 6 Slots available for Bus Masters
- 4167 Weitek Math Coprocessor Support
- Shadow RAM Caching (BIOS/Video)
- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- Floppy Drive (1.44Mb or 1.2Mb)
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Microsoft Windows 3.0 and MS-DOS
- Microsoft Mouse
- Fully Novell, DOS, OS/2, and Unix Compatible
- EMS LIMM 4.0 Support

Complete VGA Color System with 125Mb Hard Drive, 4Mb RAM, GE On-Site Service... **$5990** Just $180 Mo.!

AUSTIN 486/25 PACKAGE OPTION
- Upgrade to an Ultra-Fast 175Mb Hard Drive and a Super VGA Color Monitor with 1024 X 768 resolution...Plus 1Mb of Video RAM. $499
- Other options are available. Call for details!



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HIGHLIGHTS

- 80286 16MHz Microprocessor
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- Floppy Drive (1.44Mb or 1.2Mb)
- VGA Monochrome Monitor with VGA Video Adapter
- Complete System for only $1290.

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AUSTIN 286/16

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- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 1 Parallel Port and 2 Serial Ports
- 80287 Math Coprocessor Socket
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Built-in Setup Program
- Compatible with DOS and OS/2
- American-Made Motherboard

Complete VGA System with 1Mb RAM, 40Mb Hard Drive, and GE On-Site Service... **$1290** Just $39 Mo.!

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- Microsoft Windows Package—Windows 3.0 and MS-DOS 4.01 Pre-Loaded...Plus a Microsoft Mouse $179

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MAGAZINE
EDITOR'
CHOIC

HIGHLIGHTS

- 80386SX Intel 16MHz Microprocessor
- 2Mb RAM (expands to 8Mb on board)
- 40Mb IDE Hard Drive
- 14" Austin High Clarity VGA Color Monitor
- Super-Charged VGA Video Adapter (Supports up to 1Mb VRAM)
- Pre-Loaded with Microsoft Windows 3.0 and MS-DOS 4.01
- Microsoft Mouse
- Complete System for only $2190!

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AUSTIN 386/SX16 WINSTATION

STANDARD FEATURES

- Floppy Drive (1.44Mb or 1.2Mb)
- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 80387/SX Math Coprocessor Socket
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Compatible with DOS, OS/2, and Unix

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AUSTIN 386/SX20 WINSTATION

STANDARD FEATURES

- Floppy Drive (1.44Mb or 1.2Mb)
- Dual Floppy/IDE Hard Drive Controller—1:1 Interleaving
- 7 Expansion Slots (1 8-bit and 6 16-bit)
- 80387/SX Math Coprocessor Socket
- 1 Parallel and 2 Serial Ports
- Enhanced 101 Keyboard with Tactile/Click Touch
- Real-Time Clock with Battery Backup
- Compatible with DOS, OS/2, and Unix

Complete VGA Color System with 2Mb RAM, 85Mb Hard Drive, and GE On-Site Service. . . **$2490** Just $75 Mo.!

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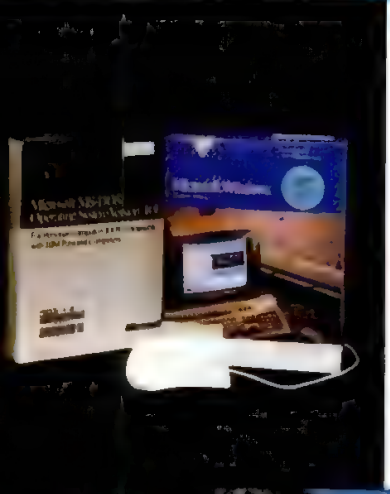

In *PC Magazine's* 386/SX-20 Editor's Choice review, they said, "The Austin 386/SX-20 PowerStation narrowly missed this award (Editor's Choice) because the FCC had not yet granted it Class B status. . ." Well, guess what! We've got it now!

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Letters

DO PEOPLE REALLY WANT THE PS/1?

I am now in the middle of reading Jim Seymour's column in the October 30, 1990, issue ("The 'Home-PC Market' Myth Rises Again") and had to stop to write this before finishing.

I agree completely with Mr. Seymour's concept that IBM and Tandy have really blown it with the PS/1 and its Radio Shack cousin, but when he says "*But stupid people don't spend two thousand dollars on PCs!*" he's dead wrong. *Only* stupid people spend two thousand dollars on the likes of the PS/1, when there's such an abundance of low-end 386SX machines available.

Ray Braguglia
Newport News, Virginia

What kind of home computer do we *really* need?

This letter concerns Jim Seymour's October 30 column. I'm a lot like Jim. I enjoy powerful, versatile systems. I spend time at home studying and programming in order to be more productive on the job. But I disagree with him on the home computer concept.

Two things have to occur for the PC to become part of the household of the general public. First, the price has to become affordable, and second, the PC must be simple and easy to use!

The general public is *not* concerned about the CPU, BIOS, RAM, or anything technical. For example, look at the camera. The vast majority purchased today are easy to use, point and shoot, totally automatic. Not many people are concerned with ASA, shutter speed, f-stop, depth of field, and so on. Get the point?

For the general public, IBM and Tandy are right on track. Now it's only a matter of price.

Edward C. Mack
St. Clairsville, Ohio

I just had to write and say amen to Jim Seymour's article "The 'Home-PC Market' Myth Rises Again."

I work in a small one-girl office and run integrated accounting software and other software on my company's 386SX. I desperately want a PC for my home office. But Jim is right—I would rather die than go back to a slower machine! I would really prefer to have an IBM, but am seriously considering a good clone, because IBM does not have an affordable model—up to speed—for my needs.

Ruth A. Shore
Worthington, Minnesota

THE OPERATING SYSTEM OF THE FUTURE

Finally, somebody has written about the real world of business computing using personal computers (Power Programming, "A Prescription for the Operating System of the Future," October 30, 1990).

Ray Duncan has written exactly what needs to be understood by the business community: DOS is not dead nor is it dying. DOS has capabilities for solving real-world problems *less expensively* than any GUI multiuser or multiprocessing operating system. DOS needs updating; but even with current limitations, DOS still provides the best return on investment of any operating system designed for personal computers.

We need exactly what DOS has provided—an environment for the creation of programs by users. Congratulations to Ray Duncan for standing up for DOS!

Nelson Ward
Louisville, Kentucky

Ray Duncan's October 30 article was particularly thought-provoking. It is interesting to read Ray's column, which now seems to carry the message that OS/2 has missed the boat, right next to Charles Petzold's *Environments* column, which still proclaims that OS/2 will eventually triumph.

OS/2 could still succeed in the future if only it were packaged and marketed more like *Windows* 3.0: cheap, easy to get, able to run out of the box on any brand of PC, and full of utilities. *Windows* 3.0 is an incredible bargain, considering that for under $100 (or for nothing if it comes with your computer) it comes with all the tools you need to start computing—a simple word processor, communications program, cardfile database, graphics program, and more.

With OS/2, however, assuming you have the memory to run it, you still have to pay $300 or more (which I bet is more of a barrier than anyone realizes), and pray it will work on your machine if you don't have an IBM. Once it's installed, you now have a functionless shell unless you buy hundreds of dollars worth of additional software.

Windows 3.0 already has the main advantages that OS/2 was supposed to have: multitasking of large programs with a consistent interface and easy access to old DOS applications. If there were just a *Windows* statistics program and a file manager as quick and easy as *Norton Commander,* I wouldn't need to use plain DOS at all, and I wouldn't keep wondering whether I should be switching to OS/2.

Todd H. Goldberg
Philadelphia, Pennsylvania

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CIRCLE 345 ON READER SERVICE CARD

Letters

SPEAKING OF OS/2 . . .

I must take serious issue with Charles Petzold's claim in his September 11 column that OS/2 will end up on people's desktops in three years. I happen to have OS/2, DOS, and *Windows* on my computer at work, and several programs that I use won't run in the DOS compatibility box under OS/2. Moreover, who wants to pay two to five times more for an OS/2 version of a DOS program?

If I pick up a catalog of software, the DOS programs outnumber the OS/2 programs at least 1,000 to 1. Even if I could get reasonably priced OS/2 programs (is that an oxymoron?), I couldn't run them on my home computer, because it can't support OS/2.

What possible advantage does OS/2 offer me or any other PC user when all the disadvantages are taken into account? It sounds like the sum of the negatives is greater than the sum of the positives. Sorry, Charley, but I just can't agree with you on this one.

Bill Butler
St. Louis, Missouri

WHICH LAPTOP TO CHOOSE?

Maybe you can tell me something. Why would an otherwise rational person pay $4,847 for a Texas Instruments TravelMate 2000 or $4,793 for a Sharp PC-6220 when he/she can buy a CompuAdd Companion for $2,895? These computers are all the same and they are all advertised in *PC Magazine*. I would really be interested in knowing what value is added by Sharp or Texas Instruments for the additional money.

David J. Duncan
Altoona, Pennsylvania

PC MAGAZINE Sharp and Texas Instruments sell their products through authorized dealers, while CompuAdd sells directly, either through its chain of computer stores or via 800 mail order. The Sharp and TI prices are suggested list prices, but you can expect discounts from the dealers to drop the prices closer to what CompuAdd charges.—*Ed.*

MICRO CHANNEL'S THE ONE

I appreciated the article "Cashing In on the Micro Channel" (October 30, 1990). In my experience, Micro Channel offers significant advantages today.

We use a LocalTalk network to share a PostScript laser printer among PCs and Macs. Configuring ISA bus PCs to operate with the network cards was extremely difficult.

> What possible advantage does OS/2 offer me or any other PC user? It sounds like the sum of the negatives is greater than the sum of the positives.

We purchased several PS/2 MCA computers in the last year. We are thrilled with the Micro Channel's software configuration. Totally automatic. Absolutely no problem in setting up the network cards.

I did notice one error in the article. In the review of the IBM 65SX, you indicate that you must use high-price IBM memory at about $700 per megabyte (list price) versus $100 per megabyte street price for off-the-shelf RAM. Not true. Many independents manufacture PS/2-compatible memory modules. I just purchased a 2MB (6450604 compatible) memory module from an advertiser in *PC Sources* at a price substantially below $100 per MB.

Emanuel Klein
Purdys, New York

WE FORGOT A USER GROUP

I was rather startled to read in your Advisor column (October 16, 1990) your answer to a reader advising her about user groups in the Chicago area. No mention was made of the Chicago Computer Society. We have a membership of almost 3,000; we are people who are serious about the PC, and most of us rely on it for our livelihood.

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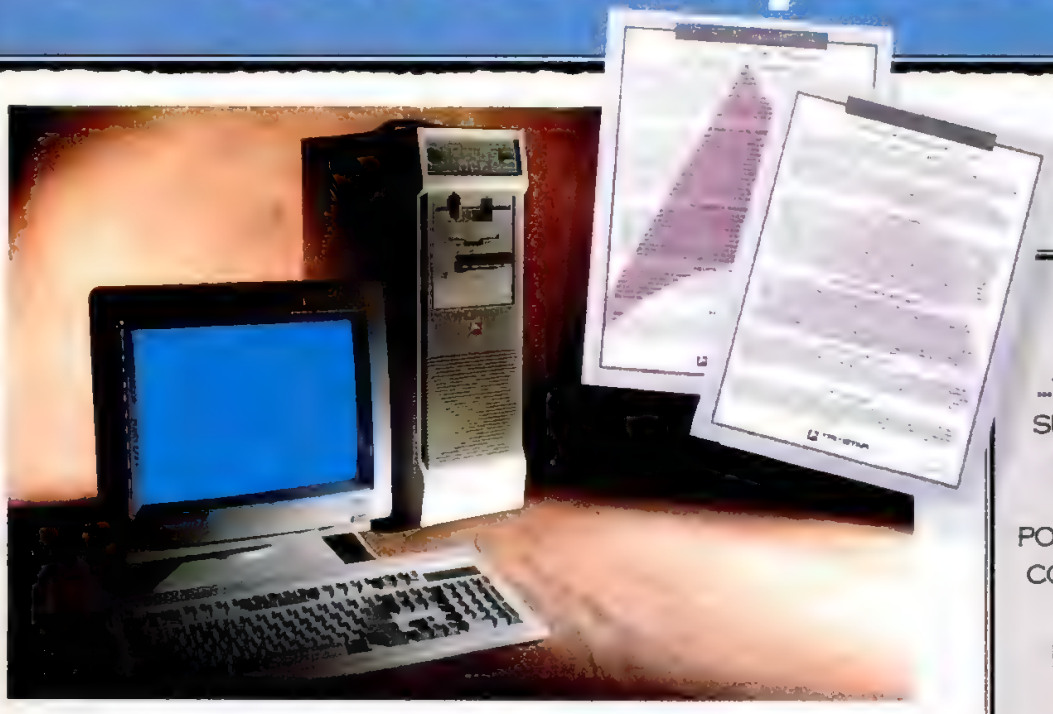

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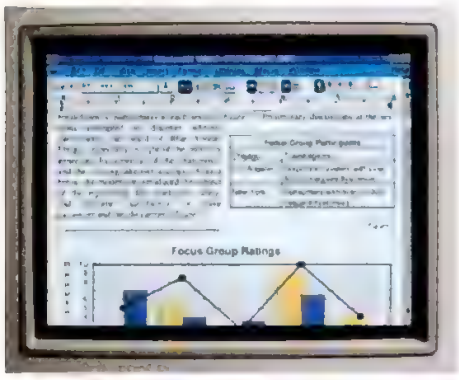

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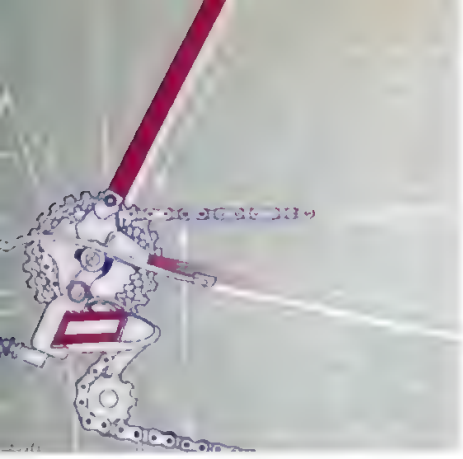

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Letters

nual Chicago Area Computer Show.

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Julie E. Stephens
Chicago Computer Society
Western Springs, Illinois

WOMEN AND COMPUTERS

Looking at the computer industry as a whole, I find it interesting to see the imbalanced participation level of women. There are many theories regarding the "gender gap" in computer usage, most of them undocumented.

I have begun an extensive research study on women and computers. I would appreciate hearing from any of your female readership interested in completing a survey for this study.

Peggy Cole
P.O. Box 161775
Cupertino, CA 95016

MORE THOUGHTS ON WINDOWS

I recently bought a PC for my home; it came bundled with *Windows* 3.0. I had read all your articles about *Windows* and was interested in trying it out and seeing it work.

After several weeks of using the software, I arrived at a simple conclusion: If I had wanted a Macintosh, I would have bought one.

I have since deleted all the *Windows* files and returned to my trusty DOS file launcher. I realize that character-based versus GUI operation is a matter of preference. My problems, however, lead me to believe that a *Windows* standard is far from an eventuality. My recommendation: don't bother.

David P. Costanza
Alexandria, Virginia

Windows 3.0 in 386 enhanced mode certainly looks very attractive. Bill Gates and Co. are definitely smart people, but in the discussion, one assumption seems fundamentally wrong and this is what I would like to address.

I agree that if computers were easy to use and affordable, the goal of a PC on every desk would likely be achieved. The assumption I dispute, however, is that DOS computers are hard to use because of the *absence* of a graphical user interface.

The main reason DOS computers are hard to use is because of all kinds of conflicts: among drives, controllers, memory cards, network cards, video cards, serial cards, IRQs and I/O addresses, and the programs that use them.

Currently it's up to the *user* to referee these, with directions for DIP switches, jumpers, command line switches, installation programs, and so on, all with documentation that is incomprehensible to mere mortals. *Windows* 3.0 doesn't fix this problem, so DOS computers are still going to be hard to use.

This mess has got to be straightened out. Why can't the operating system referee these conflicts? Develop a standard where every device and every program registers itself with the operating system and automatically adjusts for conflicts. Seems fundamental to me.

Pat Anderson
Fall City, Washington

CORRECTIONS & AMPLIFICATIONS

In our recent review of 20-MHz 386SXs, the *PC Magazine* Fact File for the Micro Express ME 386-SX/20 accidentally carried the Editors' Choice logo. In fact the Editors' Choices for this class of machines were the NEC PowerMater SX/20 and the Tangent 386SX/20.

The correct phone number for contacting the University of Phoenix concerning the bachelor's and master's degree programs offered via electronic mail (*Pipeline*, October 30, 1990) is (800) 388-5463.

The correct name of the program reviewed in *First Looks*, September 25, 1990, is *Kappa-PC*, not *Kappa*. It is a brand new product, and not ported from the company's LISP product.

HOW TO WRITE TO PC MAGAZINE

We welcome your comments, complaints, insights, and suggestions. Please send them to Letters, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access information). All letters become the property of *PC Magazine* and are subject to editing. ■

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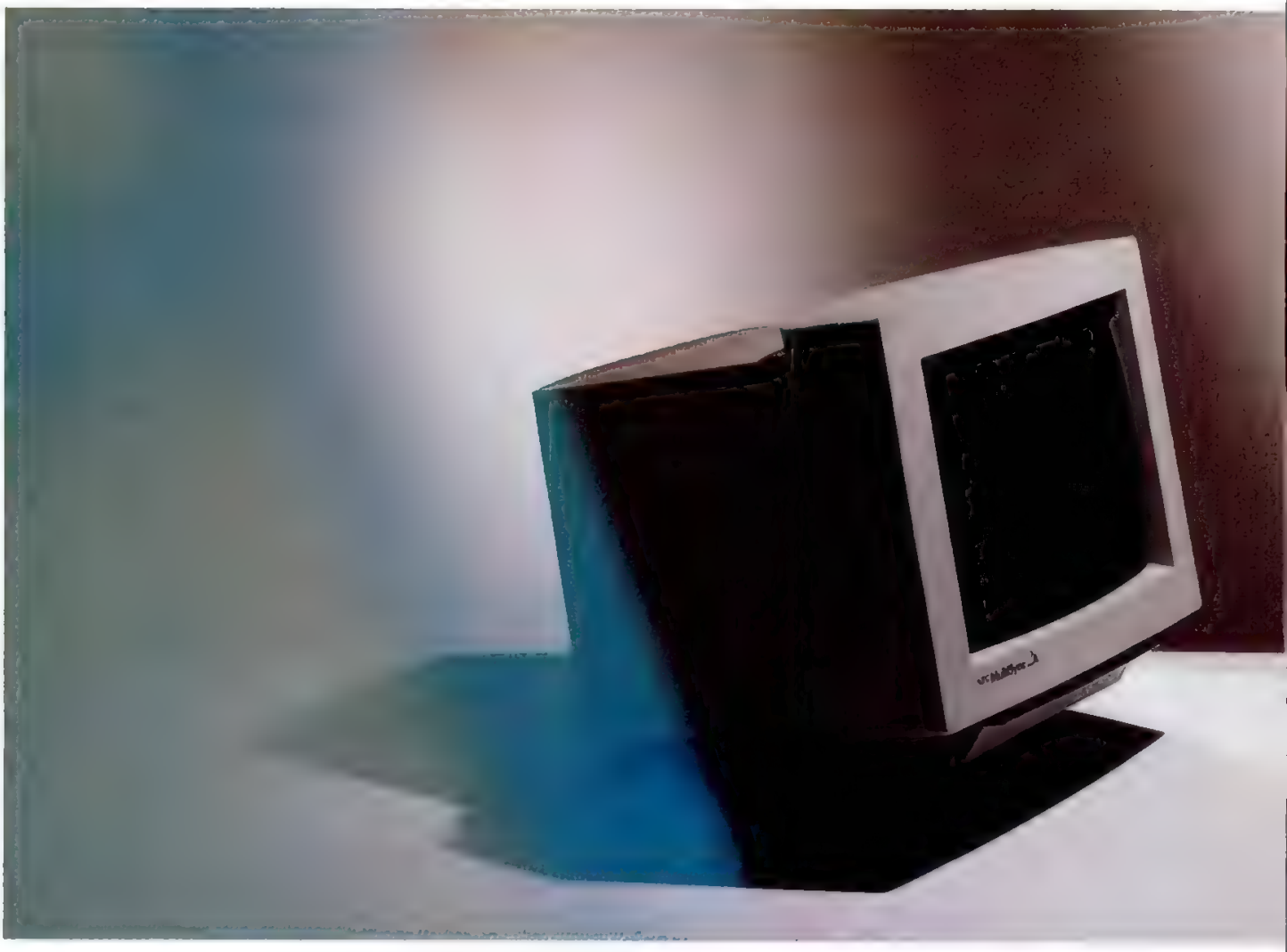

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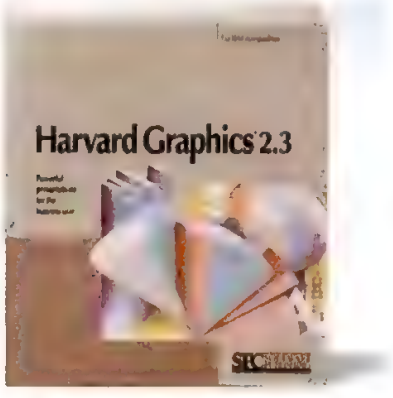

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by
Gus Venditto

Advisor

KEEPING OLD VERSIONS OF WORDSTAR ALIVE

For many years I have used *WordStar* 3.31 in my legal practice and have built up a large set of *ProKey* commands which would be a great deal of trouble to change.

I have continued to get the updates for *WordStar*, having currently about five different versions around the office, but I still prefer the basic features of the 3.31 version. I recently wrote to WordStar about a driver for the HP LaserJet explaining that I had purchased most of their later versions; their response was a form letter encouraging me to buy the 6.0 version that I already have.

Please let me know if anyone has created a LaserJet driver that will work.

Tom K. Smith
McRae, Georgia

PC MAGAZINE You may already have what you need. Back when you upgraded to 4.0, you got a version that has HP drivers, will work with your *ProKey* macros and will require relatively little change in your work habits.

If you have a serial connection to the LaserJet, you won't have to give up Version 3.31 at all; there's a driver for sale by Trio in Buffalo, New York (716-892-9630). It's $45 but it will *not* work with a parallel printer connection.

By the way, your fellow old *WordStar* users may want to take advantage of another offer; Trio sells the upgrade to *WordStar* 4.0 for $90.

- KEEPING OLD VERSIONS OF WORDSTAR ALIVE: The source for HP LaserJet drivers.
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- PUTTING MORE WORDS ON A VGA SCREEN: All the ways to get more lines on a *Quattro Pro* screen.

CONVERTING CPT DISKS TO WORDPERFECT

My law firm is converting its word processing system from an old CPT dedicated word processor to *WordPerfect* 5.1 on PCs. We have hundreds of these 8-inch disks.

We want to find a way to convert the data over to the *WordPerfect* format and have found a software manufacturer—White Crane Systems of Norcross, Georgia—that will create the necessary conversion programs. In order for the conversion to work, we need a method of transmitting the information stored on the 8-inch floppies to our PCs. Where can we find an 8-inch disk drive that will read our CPT disks? And, will the driver come bundled with a controller card for a PS/2 or a Compaq clone?

Mark Curnutte
Vinita, Oklahoma

PC MAGAZINE Yes, you can find a disk drive that will plug into either an ISA or Micro Channel computer, though you have other options.

Whichever you choose, you won't need White Crane's conversion software; it's appropriate when converting from one PC word processing format to another, not for getting files from foreign systems.

The disk drive you may want to get is called the Shafstall 6000. It costs $5,500 for the base unit, with options for multiple disk formats; you'll need to buy Shafstall's translation software that can handle a variety of formats. For your job, that will add another $495 to the bill. Call Shafstall Corp. in Indianapolis for details (800-248-3475).

Unless you intend to continue using your CPT system, you may find you'll get better value by using one of the many conversion services. You pay on a per-disk basis.

There are at least a dozen companies across the country that will accept your CPT disks and return disks in *WordPerfect* format on either 3.5-inch or 5.25-inch disks. They'll convert the disks to *Samna Word*, *DisplayWrite*, *MultiMate*, *WordStar*—you name it. And just about any original format can be converted: Wang, NBI, Exxon, Vydec, Lanier; if it was any kind of standard, someone will convert the old disks.

First Run Computer Services in New York City (800-833-2207; 212-779-0800) charges $39 to convert one CPT disk to *WordPerfect* 5.1 on a 5.25-inch disk; the company adds $3 to the charge if you need 3.25-inch disks. Since you'd qualify for a volume discount, you'd pay $14 for each 5.25-inch disk you had converted.

Their rates and range of services are typical, but if you want to shop around, here are some companies to try:

Company Compendia in Chicago, Ill. (312-419-8771).

Conversion Specialists in El Segundo, Calif. (800-825-0540).

Pivar Computing Services in Buffalo Grove, Ill. (800-CONVERT).

Total Service Conversions in Los Angeles, Calif. (800-5-CONVRT).

PUTTING MORE WORDS ON A VGA SCREEN

After being spoiled by the 19-inch screen on a Mac II, the 16-inch VGA display I have on my PC doesn't seem enough. Apparently, to have more words you are limited by the drivers supplied by your board vendor.

If this is true, is there any software that would allow me to display more rows and columns with *Quattro Pro*?

Jon Hsu
New York, New York

Advisor

It's generally the software vendor who supplies the drivers for programs. In some cases, a hardware vendor will provide drivers for major programs when it introduces a new video board, but new programs generally come with drivers for the current crop of popular video boards.

Software companies that maintain forums on CompuServe will sometimes post additional drivers there that can be downloaded, or they may maintain their own bulletin boards.

But, there's no clear responsibility for making new drivers a priority; software and hardware companies generally point a finger at each other when someone's left out.

You, however, are in luck. The first thing you want to do is to explore *Quattro Pro*'s video settings; try the /Options Display Mode menu selections. You'll find a choice of 43 or 50 lines for a VGA display. The latest upgrade (which wasn't ready as this was written but should be available by the time this magazine is printed) will have even denser displays for some VGA boards.

Here, we get into the chicken-and-egg problem: Borland is supporting the major boards with extended VGA, including ATI, Video 7, Everex, Headlands, Sigma, and many more. If you've got a different model, ask Borland, and then ask your video board maker. There's no guarantee that your board will be included.

When all else fails, try GSS—it's the leading supplier of drivers for screen and output.

If these extra modes don't satisfy you, try Personics' *UltraVision*. It's a $119 program that will give you several options for increasing the amount of text on a screen up to 132 columns; it also offers a higher resolution for your display card's text font. That may be important if, as you increase the number of characters displayed, you find the text becomes illegible. And finally, *UltraVision* will accelerate the speed of your display. (Personics, Maynard, Mass.; 800-445-3311).

When all else fails, try GSS—Graphic Software Systems in Beaverton, Oregon. It's the leading supplier of drivers for screen and output. While there's no reason for it to support *Quattro Pro*, the company has a whole line of high-resolution drivers for programs like *Harvard Graphics*, *PlanPerfect*, *CAD-Write*, and dozens more. Give them a call at 503-641-2200.

ASK THE ADVISOR

Send your questions to PC Advisor, One Park Avenue, New York, NY 10016 or upload them to PC MagNet (see the instructions for joining on page 8 of this issue). Sorry, but personal replies are not possible. ■

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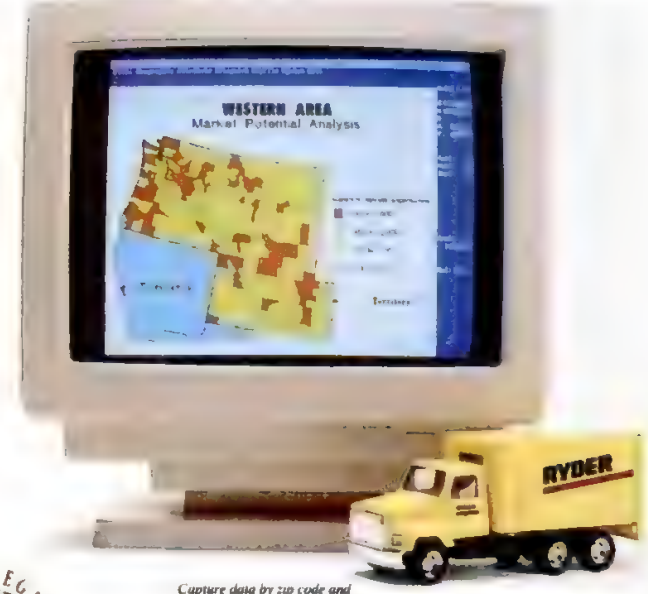

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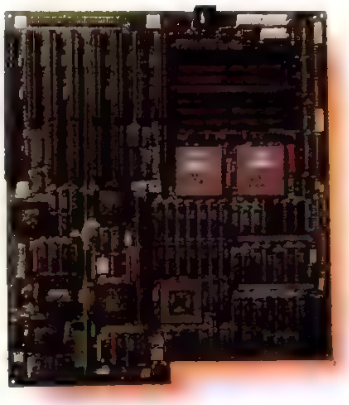

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First Looks

Hands-On Reviews of the Latest Products

Kudos to Corel: Sizzling New Effects, Same Profound Interface

HANDS ON
by Luisa Simone

The most important ingredient in any computer-generated graphic is old-fashioned imagination. The latest upgrade to *CorelDRAW*, the $695 Version 2.0, demonstrates that the same ingredient is essential when designing the graphics application itself. The Corel Systems' programmers appear to have let their imaginations run wild with visions of powerful new tools, and then they wrote the code to make these imaginings function on your PC.

An entirely new menu, Effects, contains features with which you can metamorphose any vector object within *CorelDRAW*. Functions such as nonlinear transformations, extrusions, perspective effects, and shape interpolation sound serious. Certainly the math involved is very sophisticated, but in actuality these effects are created rather simply.

For example, achieving a transformation is a simple three-step operation. You select an object, a piece of clip art, or a text string; pick one of four envelope editing modes; and then use the control points on the bounding box (a.k.a. envelope) until you achieve the desired transformation.

Creating an isometric projection, or extrusion, requires only that you enter values for the *x* and *y* offsets into a dialog

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IBM Unveils Its 33-MHz 486 Portable

HANDS ON
by Matthew J. Ross

Coming on the heels of its new desktop Model 90 and tower Model 95 486 computers, IBM's P75 486 portable could almost be perceived as an afterthought. Almost. Lacking some of the cache-driven disk and processor speed of its siblings, the $15,990 33-MHz P75 nevertheless provides sound workstation power in a 22-pound portable.

At 12 by 18.3 by 6.3 inches, the AC-driven P75 externally resembles the 25-MHz 386-based PS/2 Model P70, although the P75 is one and a half pounds heavier and an inch wider. IBM uses that extra room efficiently; the evaluation unit included 8MB RAM, a 160MB SCSI drive, and four Micro Channel slots. And despite its considerable weight, the unit's even weight distribution, cushioned handle, and slim briefcase-like styling make it seem several pounds lighter.

The P75 has the same style fold-down 3.5-inch floppy drive found on the Model P70. Hard disk choices include either the 160MB hard drive, or IBM's new 400MB 11.5-millisecond hard disk. Both use the SCSI-1 interface. The video's subsystem features a 10-inch diagonal gas plasma display, internally powered by IBM's new Extended Graphics Array (XGA) adapter featuring 1MB of video memory (VRAM). The plasma display is limited to 16-shade gray-scale VGA, but the P75 supports external interlaced monitors with resolutions up to 1,024-by-768 pixels with 256 colors via a 15-pin connector at the rear.

What makes the P75 exciting is the upgradable architecture that approaches the design of IBM's Model 90 and 95 486 computers. The P75's systemboard holds the intelligence necessary to control the Micro Channel architecture as well as the SCSI controller, and up to 16MB of system memory in four SIMM banks. Notably, the CPU resides on a separate daughtercard, making this system a likely candidate for future CPU upgrades. The XGA video circuitry also resides on a separate daughtercard and could also be enhanced later on.

Extending perpendicularly from the systemboard is the four-slot expansion bus. Expansion boards install vertically, parallel to the systemboard. There's room for two full-length 32-bit boards on top, and to make space for the 120-watt power supply and cooling fan, two half-length 16-bit slots below. In our test unit these held a 2,400-bps internal modem and an Ethernet adapter.

A hinged compartment to the rear of the unit allows access

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IBM's new PS/2 Model P75 486 portable packs a 400MB SCSI hard disk, XGA video, and 16MB RAM in a 22-pound workstation-to-go.

CorelDRAW

CONTINUED FROM PAGE 33

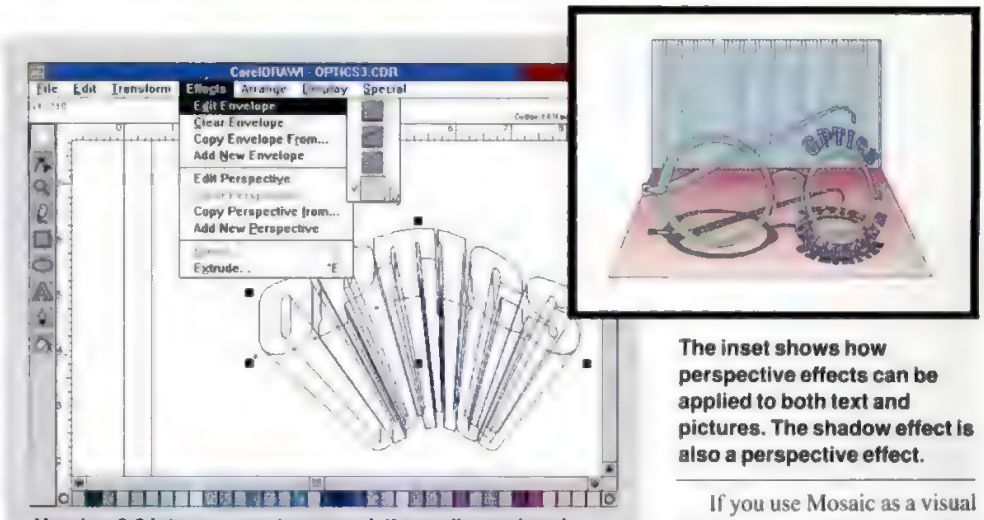
box. And because the true perspective tool actually places a vanishing point on the screen, it is very easy to make a selected object appear to be sitting in three-dimensional space. *CorelDRAW*'s Blend function allows you to determine the number of steps it will take, and the degree of rotation that will be used to transform or interpolate one shape into another.

The number of transformations that you can apply to an object is limited only by the amount of RAM available. Because *Corel* stacks each permutation in memory, you can undo the various effects either by clearing each level of the stack, or by reverting to the original shape. Experimentation is hassle-free.

Some complex, multiple transformation drawings proved to be too sophisticated for my laser's PostScript interpreter—it just wouldn't print. Sometimes it's possible to solve this problem by converting the object to curves, but once you do, the special effects cannot be reversed.

Corel's improvements don't stop with special effects. Indeed, no aspect of the program has escaped revision. In addition to 51 new fonts (for a total of 153), the text tool now has three distinct functions: the familiar headline text, a paragraph mode that formats up to 4,000 characters in up to eight columns, and a text tool that delivers you to the all new 3,500-item symbol library.

You can use all of *CorelDRAW*'s standard formatting features on body copy, setting intercharacter, interword, and interline spacing in the dialog box, or you can make these same adjustments interactively by using the node edit tool. But don't confuse *CorelDRAW* with a desktop publishing product—it's not. It still can't handle multipage documents, can't flow text around graphic elements, or jump text from one frame to another.



Version 2.0 lets you create warped, three-dimensional, perspective effects on text or pictures. Here the free-form envelope editing mode is selected.

The inset shows how perspective effects can be applied to both text and pictures. The shadow effect is also a perspective effect.

Users can now customize the pencil tool to work in either the standard freehand drawing mode—in which *CorelDRAW* fits the best curve to your mouse movement, or in a more disciplined Bezier mode—in which the user determines the position of every node and tangent point. By specifying these options in the preferences menu, the program incorporates this new function without ever changing the toolbox.

In fact, the programmers have managed to graft dozens of new features onto the product without changing its look or feel one iota. If you have worked with older versions of *Corel*, you'll find yourself accessing the new and improved functions intuitively. For example, the 80 arrow line endings, 35 vector fill patterns, and 49 bitmap fill patterns are all new, and yet feel as though they were always a part of the flyout menus for the line and fill options.

And though you may not realize that the quick-pick palette along the bottom of the screen is a Version 2.0 addition, this easy color reference is part and parcel of *Corel*'s newfound ability to import 4- and 8-bit color or gray-scale bitmaps. Version 2.0 also lets you specify color using RGB or HSB values in addition to the standard CYMK and Pantone methods.

Previous inconsistencies have also been fixed. The shape tool works correctly; you can indicate the precise placement of a new node, or break a line into two segments in one step. The grid alignment now works properly even when your grid increases, and the offsets in the preferences menu don't match.

Version 2.0 gives you more intelligent options for customizing your workspace. For example, now you can program the right mouse button. The cursor keys on the numeric keypad now let you nudge objects in specified increments for precise positioning. You can pull down sticky guidelines from the rulers to align objects. And (finally) you can actually display the grid on-screen. Also an improved status bar gives you more information than ever about the selected object.

PostScript experts will appreciate the new output features that allow you to trap and overprint colors for accurate four-color separations. And the new curve flatness setting lets you increase or reduce the quality of the curve segments at print time.

Previous upgrades to *CorelDRAW* had preserved the integrity of the drawing program by adding new functions via bundled (but standalone) utilities. Version 2.0 is no exception. In addition to the WFNBOSS type-conversion utility (which now imports and exports Adobe Type 1 fonts), and CorelTrace! (which now traces color and gray-scale bitmaps), *Corel* bundles a file-management utility called Mosaic.

If you use Mosaic as a visual file manager, loading a drawing is as simple as double-clicking on a black-and-white bitmapped thumbnail. Mosaic also provides a rudimentary screenshow utility. But the batch operation functions for printing, exporting, or importing files are of much more use, as is Mosaic's ability to store images in a compressed format.

Corel hasn't yet implemented a layering scheme for object management. Nor does it support vector clipping. And there is currently no way that you can add hinting information when you export an Adobe Type 1 font. Compared to the truly exciting changes in Version 2.0, my few wish-list items just aren't imaginative enough. ■

FACT FILE

CorelDRAW, Version 2.0
Corel Systems Corp., 1600 Carling Ave., Ottawa, Ontario, Canada K1Z8R7; (613) 728-8200
List Price: $695 (upgrade from any version, $99).
Requires: 640K RAM (1MB recommended), hard disk, *Windows* 3.0, DOS 3.3 or later, graphics adapter, mouse.
In Short: Though the list price has risen by $100, *CorelDRAW*, Version 2.0, is worth every penny. Special effects can turn even inexperienced artists into master draftsman. The Mosaic utility adds the ability to preview and compress images. Most importantly, the basic drawing tools have been fine-tuned, and power is increased, while the interface remains self-explanatory.

CIRCLE 707 ON READER SERVICE CARD

IBM PS/2

CONTINUED FROM PAGE 33

to the slots. The panel swings open, revealing the four slots, the external video, serial, and parallel ports, as well as an external floppy disk drive port, and the SCSI terminal for connecting external SCSI devices such as tape and CD-ROM drives. The close proximity of the ports may make hooking up a phone line or Ethernet cable and a SCSI device difficult, though.

The 101-key keyboard features separate cursor and numeric keys, plus 12 Fn keys across the top. Unlike many of the "luggable" or "lunchbox" portables that require you to plug in the keyboard cable, the P75 keyboard is always connected to the machine. Because it's so light, the keyboard tends to slide around your desktop while typing, or be pulled by some unseen gravity back toward the system. Also, when returning the keyboard to the unit, a small plastic tab on the keyboard depresses the power switch, making it impossible to have the P75 on with the keyboard closed.

One other attribute that distinguishes the P75 from its 486 lunchbox portable competition is its metal-lined plastic case, and its FCC Class B rating. This safety feature combined with its workstation power make the P75 ready for serious work wherever you can find an AC outlet. ■

List Price: IBM PS/2 Model P75 486 with 8MB RAM, 160MB SCSI hard disk, 1.44MB floppy disk drive, VGA gas plasma display, DOS 4.01, $15,990; with 400MB hard disk, $18,890. IBM Corp., 1133 Westchester Ave., White Plains, NY 10604; (800) 426-2468.

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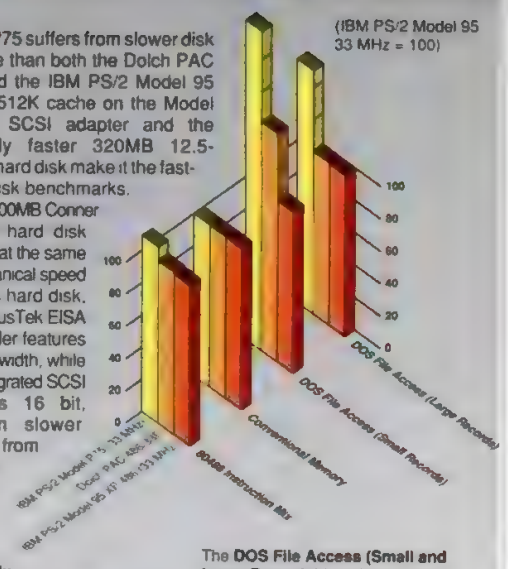
BENCHMARK TESTS: IBM PS/2 MODEL P75

LABS

The Model P75 suffers from slower disk performance than both the Dolch PAC 486/33E and the IBM PS/2 Model 95 tower. The 512K cache on the Model 95's 32-bit SCSI adapter and the mechanically faster 320MB 12.5-millisecond hard disk make it the fastest on our disk benchmarks.

Dolch's 200MB Conner Peripheral's hard disk drive is rated at the same 16-ms mechanical speed as the P75's hard disk, but Dolch's BusTek EISA SCSI controller features a 32-bit bandwidth, while the P75's integrated SCSI controller is 16 bit, resulting in slower throughput from the controller to the CPU.



The **80486 Instruction Mix** benchmark test times a series of tasks specific to the 80486 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.

The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at slower access speeds.

The **DOS File Access (Small and Large Records)** benchmark tests time disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. These tests are performed without software disk caching. Fast times on the small records segment are advantageous for programs that work with many short segments of data. The large record segment of the DOS File Access test minimizes the effect of small hardware caches on disk subsystem performance. Fast times here are advantageous when large files are loaded.

Performance Times (Times given in seconds)	80486 Instruction Mix	Conventional Memory	DOS File Access (Small Records)	DOS File Access (Large Records)
IBM PS/2 Model P75 (33 MHz)	1.21	0.22	74.64	5.74
Dolch PAC 486/33E	1.12	0.22	53.46	3.83
IBM PS/2 Model 95 XP 486 (33 MHz)	1.11	0.22	37.80	3.81

RasterOps 1024mc: True-Color Comes to MCA

HANDS ON by Bill O'Brien

RasterOps Corp., a leading force in Macintosh 24-bit True Color video is now playing its hand in the IBM world. The RasterOps 1024mc is a $4,395 video board designed for Micro Channel machines. The advent of true color is significant for the PS/2 family, but the board may be a bit ahead of its time.

The board specifications are impressive. Using a combination of surface-mount devices (SMD) and custom-designed very large-scale integrated (VLSI) circuits mated to 3MB of video RAM, RasterOps has created a unique environment for MCA machines. The 24-bit pixel depth (8 bits each for red, green, and blue) allows a 16.7-million color palette with a 1,024-by-1,024 addressable resolution. With just under 17-million colors even the most esoteric blends are within reach. The display area is 1,024-by-768, and output is handled by analog signals through a 15-pin D-sub connector.

There's also a VGA pass-through mode for 640-by-480 resolution images in a window within the board's 1,024-by-768 display area. Full-screen VGA is possible, with 640-by-480 resolution, on multiscanning monitors.

RasterOps ships the board with drivers for *Windows* and Presentation Manager (although only a preliminary release of the *Windows* driver was available for the review). *Image Prep*, a graphics utility that ships with the board, was also unavailable at press time. Software support has been promised from *PowerPoint, Arts & Letters, CorelDRAW*, and *PageMaker*, among others.

But an element's missing from this "piece of the Macintosh" ported to the PC environment. Mac versions of the board have simultaneous live video display capability, or at least split-screen capability for static images, as well as the true color imaging. They also take advantage of 32-bit QuickDraw, the Mac's graphic handler.

With no graphics processor on-board, and none in the PC, the 1024mc, at 1,024-by-768, posts video speeds that are six to ten times slower than equivalent functions at VGA resolution. Granted, the overhead can be attributed to the increased color resolution, but the operations are slow nonetheless.

There are also no input ports on the 1024mc. Importing graphic images becomes the domain of a scanner, and 24-bit scanners are now at a premium (not to mention the burden placed on a PC's resources when scanning 24-bit images).

The last limitation is in the display technology. Connected to a NEC 5D monitor, the color display was vibrant but slightly dull; RasterOps placed the responsibility for this on the 5D. In the Macintosh world, a board like the 1024mc would be routinely accompanied by a $4,000 to $5,000 monitor. While the 5D's price is almost at the low end of that range, you apparently need better to show off the RasterOps color.

Eventually, the 1024mc will flourish. For now, RasterOps needs to wait for the other PC software and hardware players to catch up. Until then, it can expect a limited and very specialized reception. ■

List Price: RasterOps 1024mc, $4,395. **Requires:** IBM PS/2 or MCA compatible. RasterOps, 2500 Walsh Ave., Santa Clara, CA 95051; (408) 562-4200.

CIRCLE 708 ON READER SERVICE CARD

Threadz File F/X: A Quintet For Windows

HANDS ON
by Barry Simon

Threadz *File F/X* is the latest utility to pick up the manage-your-*Windows*-better gauntlet. It's a collection of five linked programs designed to function as your cockpit for *Microsoft Windows* 3.0. The most spectacular component of the bunch is a replacement for the *Windows* Task Manager called Threadz Task Manager. Also included are a solid file-find program and serviceable programs to manage files, search text, and undelete files.

The hub of *File F/X* is the F/X File Manager. This offers all the capabilities of *Windows* Fileman (except disk formatting) but has the feel of a DOS file manager. You can sort on date/time or size of a file, and a tree displays disk structure.

To copy from one tree to another, the dialog box displays a tree on the destination drive. For quick redisplay, the program saves a copy of each drive's tree in its root directory. A nice touch is its ability to copy the name of a directory, an entire tree, or a file list to the clipboard. Still, it should have multiple tree displays and file viewers. Since F/X File Manager makes no use of object orientation or multiple windows, you cannot drag a file from one directory to another as you can with *Windows* File Manager. It does, however, make good use of dialog boxes and menus.

F/X File Find is a slick application for locating files. You can search for a filespec on one or more drives or directories, and also restrict the search to on, after, or before a given date. These criteria can even be saved and reused. Searches are reasonably quick, and the results of the search can be saved to disk, printed as hard copy, or pasted to the clipboard. From the clipboard you can paste the list into the F/X File Manager and deal with it as if it were a directory.

F/X Text Search lets you specify a single text string and search for it in a group of files with a given filespec, and in one or more drives and directories. The search can be case-sensitive or specify whole words, but Boolean searches are not supported. As with the file search, you can copy to the clipboard and paste into the F/X File Manager. The reports generated to disk or printer can include the occurrences of the search text in each file and the line numbers where the text may be found. But you will not be able to view found text in context.

F/X File Undelete is a simple but useful application. Its display window is split into two parts—a tree and a list of erased files. Next to each filename the word "likely" or "unlikely" appears, rating the probability for a successful undelete session. The method works for files that are contiguous, but there's no comparison to the *The Norton Utilities* tools.

The final and most distinctive element in the group is the Threadz Task Manager, which replaces the *Windows* Task Manager. The Threadz Task Manager has a menu you can use for launching your own applications; it's shared by the F/X File Manager, includes a "run" line, and will remember the last 20 commands issued even from previous sessions.

The Task Manager's ability to arrange your windows extends far beyond the *Windows* TaskMan: You can cascade them, arrange them in a grid, or have all the windows occupy a full screen (leaving room for icons). Then you can shift between the windows with Alt-Tab. Also included is a simple screen blanker that will accept a supplied bitmap or metafile for display over the blanked screen.

Every serious *Windows* user will want the Threadz Task Manager and will find the other four programs useful. Threadz's lead software engineer, Art Metz, developed the shareware precursors of the Task Manager and File Manager. Registered users of any Metz shareware program can upgrade to the full *File F/X* package for only $49.95. ■

List Price: *File F/X*, $129.95. **Requires:** *Windows* 3.0, DOS 3.1 or later. **In Short:** A wonderful task manager and four other useful utilities makes this a must-buy for *Windows* users. Threadz Software Design Group, 4018 148th Ave. NE, Redmond, WA 98052; (206) 869-6292.

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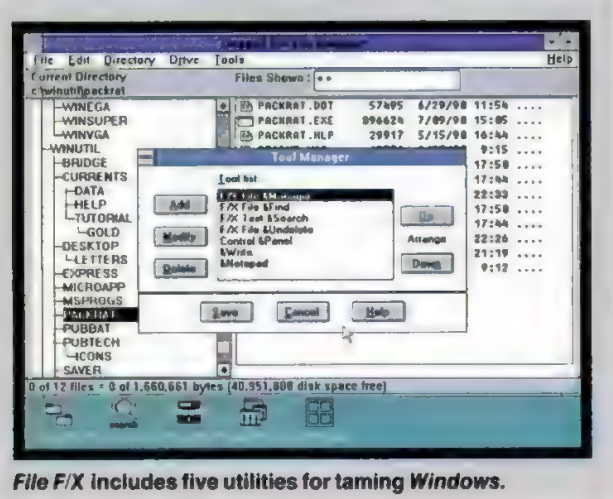

File F/X includes five utilities for taming *Windows*.

Whiskers: A Deeper Life for Mice

HANDS ON
by Charles Bermant

An outrageously inexpensive *Microsoft Windows* utility—*Whiskers* 3.0—gets more from your mouse by allowing you to program the right and/or middle buttons. The core *Whiskers* program is a dynamic link library (DLL) that captures and processes mouse clicks.

A dialog box with a series of drop-down menus guides you through the possible assignments for button functions. If you have a two-button mouse, an additional *Whiskers* driver lets you simulate a third button when you press both buttons simultaneously.

The right and middle buttons can be used in combination with certain keyboard commands to invoke features such as Delete, Cut, Copy, or Paste under *Windows*. For example, the command Shift plus the right mouse button invokes the Paste command. Each button can have a maximum of four assigned functions. There are even routines to launch Task Manager, move to the next document, or switch to the next application.

A single click on the *Whiskers* icon pops up the menu. With unbridled cuteness, the active *Whiskers* icon appears as a mouse in a cage, eyes open. The inactive *Whiskers* icon has no cage; the eyes are closed. You can hide the icon altogether, and the Exclude control shuts *Whiskers* off for specified programs.

Whiskers requires 18.2K of memory; the *Whiskers* driver file is another 4K. The software must be installed from the external *Windows* setup program. The six-page manual, accessible in both *Windows Write* and ASCII formats, must be printed from the disk. If you want to add depth to your life with mice, *Whiskers* is worth the $15. ■

List Price: *Whiskers*, Version 3.0, $15 plus $2 shipping. **Requires:** *Microsoft Windows* 3.0, a two- or three-button mouse. Numbers and Co., Rte. 1, P.O. Box 59A, Oroville, WA 98844; (509) 476-2216.

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DesignView Focuses on CAD Analysis as Well as Design

HANDS ON
by Jeff Prosise

Today's CAD tools are proficient at representing on-screen geometry. But they stop just short of doing something really useful—helping to analyze as well as illustrate design.

DesignView, a *Microsoft Windows*–based mechanical engineering design and analysis package, fills the gap by performing sophisticated analyses on the mechanical parts and systems depicted in CAD drawings. Drawings can be imported in .DXF or IGES formats, or created using *DesignView*'s built-in construction tools.

When a dimension of a *DesignView* drawing is changed, the geometry is updated accordingly, respecting initial constraints imposed during the creation in order to preserve the relationships between elements. For example, if the length of a line is changed from 2 to 3 inches, it is redrawn 1 inch longer. If another line that adjoins the endpoint was moved, that line is moved also.

Premise calls this "dimension-driven variational geometry." Once a model is defined, you can vary the values in order to gauge the effects on other parts of the system. Computationally complex analysis can be reduced to generating a quick sketch and then plugging in different values.

DesignView can automatically step a mechanism through a series of motions by incrementing a variable on the drawing through a range of values, optionally superimposing new images over the old to generate a record of the motion. Or you can animate in real time by capturing images of the mechanism in different positions and playing them back. *DesignView* allows dimensions to be tied to other dimensions in the worksheet by specifying equations that define the relationships between them. For example, if you specify that the height of a box should always be equal to twice the width, when you change the width the height changes accordingly.

DesignView features a built-in solver for solving a wide range of equation types, from simple linear equations to simultaneous nonlinear equations. It offers 25 trigonometric, hyperbolic, logarithmic, and exponential functions and supports user-defined functions. The program's conditional functions permit you to choose an action based on the value of a variable, for example, or beep and display a warning message when a variable exceeds a predefined value.

DesignView also calculates areas, centroids, null axes, polar moments, and moments of inertia. Enclosed regions may contain holes. However, since the current version does not work with regions containing fillets or chamfers, this feature will see limited use except in calculating approximate solutions.

DesignView can be used for more than just analysis purposes; you can use it with your documents. Illustrations created in *DesignView* may be pasted directly into documents created with *Windows*-based word processors. Under *Windows* 3.0, live DDE links can be established between *DesignView* and other *Windows* applications.

The program isn't magic; you're still left to supply the equations that govern the design model. However, a separate $295 module—the *DesignView Applications Library*—contains approximately 250 canned models of problems involving fluid flow, thermodynamics, statics, dynamics, kinematics, stress and strain, and more. Once installed, the *Applications Library* is called up within *DesignView* itself.

The documentation, consisting of a loose-leaf user's manual and a *Quick Start* booklet, is superb—so good, in fact, that it won a Distinguished Technical Communications Award from the Society for Technical Communications. Included in the documentation is a series of tutorials geared to users at different levels.

You'll know if you're one of the engineers that *DesignView* can help. In the right situations, it will significantly reduce the work involved in analyzing and documenting a design. ■

FACT FILE

***DesignView* 2.0**
Premise Inc., 3 Cambridge Center, Cambridge, MA 02142; (800) 888-7736.
List Price: $895.
Requires: 640K RAM; hard disk; DOS 3.0 or later; mouse or other pointing device. *Windows* 3.0 recommended (runtime version is included).
In Short: A mechanical engineering design and analysis package that uses dimension-driven variational geometry and a built-in equation solver to make the parametric analysis of complex systems easy.

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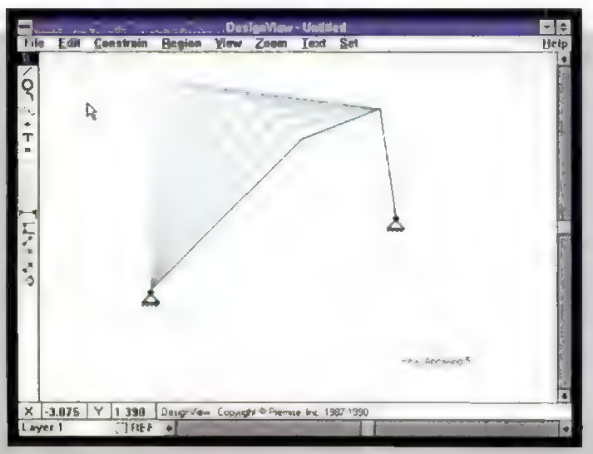

***DesignView*'s dimension-driven variational geometry can perform parametric design studies. In this classic four-bar linkage analysis, the lengths of the bars are fixed. As the leftmost bar is rotated by increasing the value of the variable that defines the angle the bar forms with the horizontal, the other bars move along with it. This model can be used to animate the motion of a four-bar linkage.**

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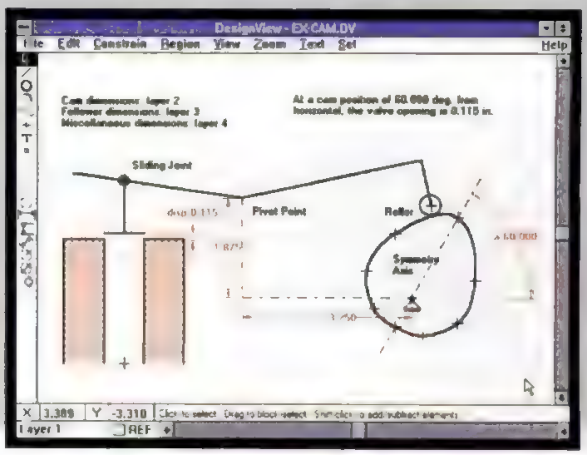

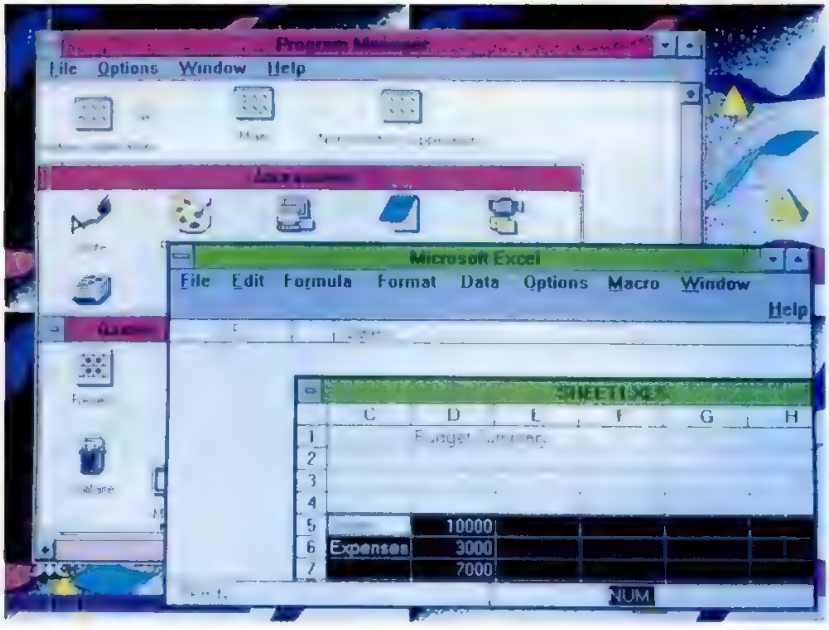

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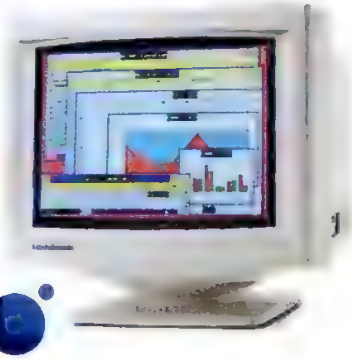

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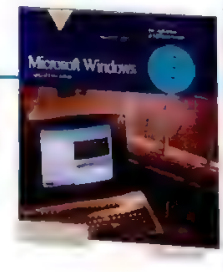

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CIRCLE 476 ON READER SERVICE CARD

Personal R:BASE: The Popular Relational Database Goes Lite

HANDS ON
by Joe Salemi

In a world where lite beer and lite music prevail, why shouldn't there be lite software, too? Microrim is the latest software vendor to release a smaller, gentler version of its flagship product—in this case a relational database.

Personal R:BASE is a $299 stripped-down version of *R:BASE* 3.1 (First Looks, December 25, 1990). It's aimed at the laptop/portable, small business, and home markets, but in all likelihood it will be most popular in *R:BASE* shops.

Personal R:BASE includes the advanced memory management of its bigger brother, using XMS and EMS 3.2 (or better) memory if available. It comes with the RVMX program, which lets DOS access the lower area of video memory and also has the ability to read and write *dBASE III, III Plus* and *IV* files. The interface is identical to *R:BASE* 3.1, with pull-down menus accessible from either the keyboard or a mouse.

Personal R:BASE's performance is identical to 3.1's: Data manipulation is very fast. The limits are also the same: Database size is only limited by disk space; the number of tables, columns, and rows per database is identical in both versions. *Personal R:BASE* data files and applications are fully interchangeable with 3.1; you can run applications created by either system on the other.

In fact, *Personal R:BASE* includes all the relational capabilities of its bigger brother. An *R:BASE* database consists of just three files: one for the definition of the database structure, the second for the data itself, and the third for the indexes. Data is stored in tables. Relational links between two tables that share a common column are created automatically when you create a new table.

A benefit of this approach is the ability to create "views," where a temporary table is created on the fly. Particular types of data are kept grouped together in their own table; data isn't duplicated. Because of this, data storage space is more compact, a critical advantage for portable users.

Other features of 3.1 that have been retained in this trimline version include Query-By-Example, support for over 100 printers, relational operators (such as JOIN, PROJECT, and UNION), and over 70 Supermath functions. Data can be imported from and exported to *Lotus 1-2-3*, .DIF, *dBASE, PFS:File, Multiplan*, and ASCII files.

So what's missing? Microrim has removed *R:BASE* 3.1's programming interface. There is no "R>" prompt or "prompt-by-example" mode; all access to data is through the menus. Also missing are RBEDIT (the programming editor) and all the multiuser and transaction processing capabilities of *R:BASE* 3.1. One programming construct is still available. Through a pop-up window, the user can enter WHERE clauses, specifying the conditions for a search.

You can still create applications using the built-in Application Express, one of the best application generators included with any PC database package. Using the *R:BASE* menu interface, Application Express steps you through the process, from creating the database through creating the screen forms and reports. Custom forms and reports use the same full-screen generators as *R:BASE* 3.1, or you can choose the default "quick" forms and reports.

Application Express also steps you through application design. You are given a choice of menu types (horizontal, vertical, pop-up, and pull-down), and you can have up to three levels of menus. One or more actions can be assigned to each menu choice, and you can create custom help screens. When you're finished, Application Express writes the code for you and writes the application to the default directory.

Using Application Express, I was able to create an inventory database—from the import of 5,000 ASCII records to the final compilation of the code—in about 45 minutes. Elements such as reports and forms, database definitions, columns and tables, and indexes are easily modified through Application Express.

Personal R:BASE comes with a particularly well-written, heavily illustrated user guide. An interactive tutorial and five ready-made applications (mailing list manager, appointments calendar, home finance management, home inventory, and recipes) are also included. These can be utilized as-is or modified through Application Express.

None of the memory management problems that prevented *R:BASE* 3.1 from working with Qualitas's *386MAX* are present in this version. One caveat applies to both versions: You must have the directory where the *R:BASE* program files reside in your path, and it must be near the front of the path statement. Anything past the fifteenth character or so prevents *R:BASE* from finding some of its support files.

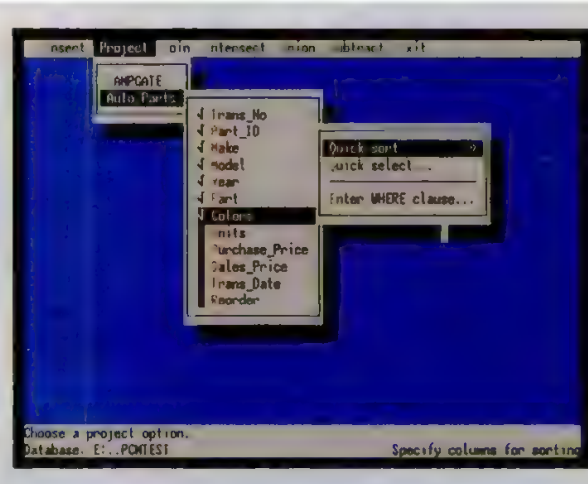
Microrim offers 30 days of free support, plus access to its 24-hour-a-day technical support line and the Microrim BBS. Extended software support is also available, and *Personal R:BASE* users can upgrade to *R:BASE* 3.1 at any time.

Personal R:BASE is ideal for *R:BASE*-run businesses with people in the field. Portable users can take their data with them. Smaller businesses and home users will also find *Personal R:BASE* a good, easy-to-use database program for creating and maintaining small-to-midsize databases. However, they may not need the relational capabilities. ■

FACT FILE

Personal R:BASE
Microrim, 3925 159th Ave. NE, Redmond, WA 98052; (206) 649-9500.
List Price: Limited-time offer, $99; full price, $299.
Requires: 640K RAM (450K free), 4.5MB hard disk space, DOS 3.1 or later.
In Short: *Personal R:BASE* brings the relational power of R:BASE down to portable size.

CIRCLE 433 ON READER SERVICE CARD



***Personal R:BASE*'s interface is virtually identical to *R:BASE* 3.1, including the relational capabilities. What's missing is the programming interface.**

Polaroid's Digital Palette CI-3000: A New Generation Of Film Recorder

HANDS ON
by Kaare Christian

Many of us need to transfer ideas and images from our desktop PCs onto film. Unfortunately, the screen-to-slide technology has been expensive and finicky—more suited to faraway information centers and service bureaus than its natural home, the desktop. But Polaroid's new Digital Palette CI-3000 makes it clear that soon we will have desktop imaging at a desktop price. How soon? That depends mostly on how quickly the industry can deliver software drivers that adequately support Polaroid's exciting new hardware.

The predecessor of the Digital Palette CI-3000 was Polaroid's PalettePlus, a popular but much lower-quality device. The PalettePlus was tied to the PC via the monitor cable, which limited it to the monitor's resolution. The new Digital Palette uses a more sophisticated image generation scheme, which gives it 2,000-line resolution and a 16.7-million color palette. Unlike many competitive units, which are limited to 256 colors per image, the CI-3000 is a true 24-bit color device that can assign any color to any pixel in the image.

The Digital Palette's 2,000-line resolution is actually half the resolution of several competitive film recorders, but for most purposes the lower resolution is not a serious limitation. Speed of operation—2 to 4 minutes for typical images—is similar to that of competitive film recorders. And the CI-3000's specs are comparable to several more-expensive units such as the Matrix PCR, the Matrix ProColor, and the Lasergraphics Film Recorder (*PC Magazine*, February 28, 1989).

The Digital Palette hardware consists of a shoebox-sized film recorder, a parallel printer cable to connect the recorder to a standard printer port, a Power Processor that processes Polaroid instant slide film, an illuminated slide-mounting device, and two interchangeable film backs: a 35-mm. film back and a pack film back. Other film backs are available.

The accessories add significant value to the product. The pack film back is useful for individually previewing shots on paper. The Power Processor lets you develop Polaroid slide film on your desktop, and the Polaroid Illuminated Slide Mounter lets you mount your desktop-developed slides.

Thus, using Polaroid slide film, you can go from a desktop image to a mounted 35-mm. slide in about 10 minutes. Of course, for the highest-quality output you should choose a conventional high-quality film, such as Ektachrome 100, which requires conventional (laboratory) processing.

The Digital Palette creates slides with 2,000-line resolution, and a 16.7-million color palette. Accessories include various camera backs, software utilities, and a slide mounter.

Installing the CI-3000 is very similar to installing a parallel printer. All you do is connect the recorder to a spare printer port on your PC using the supplied printer cable and then install and run the calibration software.

The ideal software for a desktop film recorder is a device driver that works with your application. Given the proper driver, all you have to do is to "print" from within your application to produce your slides. Although Polaroid is working with many software vendors to develop drivers, there are currently only two: one for *Lotus Freelance Plus* and one for *Presentation Express* and *35MM Express*. Coming soon, but not available during the review process, are drivers for *Harvard Graphics, Windows* 3.0, *Applause II*, and various other software packages. You should very carefully check out your driver options when evaluating the CI-3000.

If your application isn't supported directly, you must save your images to a CGM, TGA (Targa), or TIFF file, and then use Polaroid's *ImagePrint* utility to print the image. One nice feature of *ImagePrint* is its ability to add a graded background to an image.

Unfortunately, *ImagePrint* is an unwieldy, not yet perfected utility, and I experienced various incompatibilities with both CGM and TIFF image files. With CGM, some images came out much too small; others came out a tad too large. A few failed completely. With TIFF, some files worked, some lost their colors, and some failed completely. Our best results came when we used the Polaroid Presentation Express graphics software with its included driver.

Even if *ImagePrint*'s current features were implemented perfectly, support for just these file formats would be a major limitation. TGA and TIFF are bitmap formats, which typically contain much lower-resolution images than the CI-3000 can produce. A TIFF file that would take advantage of the CI-3000's color and spatial abilities would be too large to work with most software. CGM is a vector format, but it is very simple, has many flavors, and has difficulties with text and scaling.

The ideal file format for the CI-3000 is Color PostScript, because it is a solid, flexible standard supported by many graphics applications. Color PostScript support for the CI-3000 is in the pipeline from a third-party vendor but was not tested for this review.

The Digital Palette CI-3000 is an exciting piece of hardware. As drivers become available, it may realize its potential as a desktop breakthrough. ■

FACT FILE

Digital Palette CI-3000
Polaroid Corp., 575 Technology Sq., Cambridge, MA 02139; (617) 577-2000.
List Price: $4,495 includes 35-mm. camera back, pack film camera back, parallel cable, Polaroid instant slide film Power Processor, Illuminated Slide Mounter, software drivers, and *ImagePrint* utility. Options: 4-inch by 5-inch film camera back, $599; AutoFilm camera back, $399.
Requires: Parallel port.
In Short: A low-cost, 2,000-line 24-bit color film recorder, supplied with both 35-mm. and sheet film backs. Polaroid's quality hardware is currently restrained by a shortage of software drivers.

CIRCLE 437 ON READER SERVICE CARD

386 and 486 Windows users:

DOS Lives. Despite what you may have read.

Insufficient memory to run application;

close one or more applications to increase available memory and try again.

Windows 3.0 may have been a big step forward for some programs.

But it was a big step backward for DOS. Suddenly, it was 1987 all over again. Not enough room for DOS programs to run because TSRs, utilities, drivers and buffers were taking up room your DOS programs need.

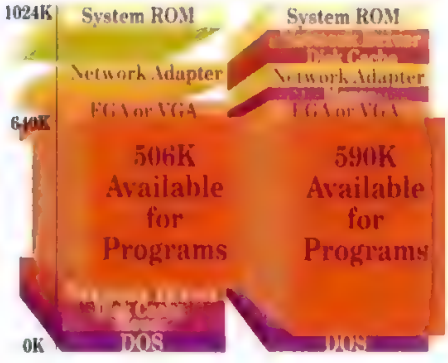
QEMM 5.1 to the rescue

Now, we've updated QEMM to provide additional memory for DOS programs within Windows 3.0.

QEMM 5.1 works with the built-in capabilities of your 80386 or i486 processor to find and recover unused memory segments. As you can see in the chart, there are gaps in your PC's memory usage above 640K. QEMM 5.1 fills those gaps and provides more room for your DOS programs to run.

And of course, QEMM 5.1 still works with DOS when you're not running Windows. You get all the same benefits: up to 130K more memory to run the new generation of memory-hungry programs; space for larger spreadsheets and database files.

When Windows 3.0 says there's not enough room to run your DOS programs, it's just trying to tell you it needs QEMM 5.1.



Before *After*

Unused memory is like hidden gold in your PC. QEMM finds it and makes it available.

Introducing DESQview 2.3 and DESQview 386 2.3 for users of Windows 3.0

They said it couldn't be done, but DESQview 2.3 can run Windows 3.0 programs. Not just in Windows "Real mode" but in "Standard" mode. That means programs can be up to 16MB.

And it can run DOS programs and DOS-extended programs i.e., 1-2-3 Release 3, side-by-side.

DESQview 386 2.3 does all that and more. It lets you run 386 DOS extended programs like AutoCAD 386 and IBM Interleaf side-by-side.

DOS, extended DOS; Windows—whatever standards you set, we will support. We're committed to helping you get the most out of your hardware and software today. And tomorrow.

QEMM-386 System Requirements: 80386-based PCs and PS/2s and PCs with 80386 add-in boards. Operating system: PC DOS 2.0-4.0, MS DOS 2.0-4.0, Windows 3.0. Conventional memory requirement 1.5K.
DESQview System Requirements: IBM Personal Computer and 100% compatibles (with 8086, 8088, 80286, 80386 or i486 processors) with monochrome or color display; IBM Personal System/2 • Memory: 640K recommended, for DESQview itself 0-155K • Expanded Memory (Optional): expanded memory boards compatible with the Intel AboveBoard; enhanced expanded memory boards compatible with the AST RAMpage; EMS 4.0 expanded memory boards • Disk: two diskette drives or one diskette drive and a hard disk • Graphics Card (Optional): Hercules, IBM Color/Graphics (CGA), IBM Enhanced Graphics (EGA), IBM PS/2 Advanced Graphics (VGA) • Mouse (Optional): Mouse Systems, Microsoft and compatibles • Modem for Auto-Dialer (Optional): Hayes or compatible • Operating System: PC-DOS 2.0-4.0; MS-DOS 2.0-4.0 • Software: Most PC-DOS and MS-DOS programs; programs specific to Microsoft Windows 1.03-3.0, GEM 1.1-3.0, IBM TopView 1.1 • Media: DESQview is available on either 5-1/4" or 3-1/2" floppy diskette.

Trademarks: Windows, MS-DOS: Microsoft Corporation, PS/2, Interleaf, TopView: IBM Corporation, 80386, i486, AboveBoard: Intel Corporation; 1-2-3: Lotus Development Corporation, AutoCAD 386: Autodesk, Inc, RAMpage: AST Research, Hercules, Mouse Systems, Hayes; GEM, Digital Research, Inc

Yes! I need increased DOS productivity in Windows!

Qty	Product	5-1/4	3-1/2	Each	Totals
	QEMM 386 5.1			$99.95	
	DESQview 386 2.3 (includes QEMM)			$219.95	
	DESQview 2.3			$129.95	
				Shipping & Handling $5 in USA/$10 outside USA	
				California Residents add 6.75%	
				Grand Total	

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CIRCLE 338 ON READER SERVICE CARD

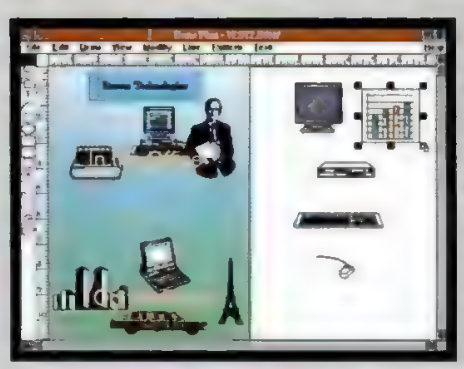
Micrografx Rounds Out Its Repertoire with Draw Plus

HANDS ON
by Robert Kendall

Micrografx Draw Plus has been around for years, though it went by the name of *Windows Draw* in its earliest incarnation. Now Micrografx has upgraded the package to make it a solid low-end complement to the vendor's drawing powerhouse, *Designer*. At $229, the *Windows* 3.0-based *Draw Plus* 1.1 sports the basic functions of *Designer* for a third of the price.

Draw Plus is great for modest drawing tasks or for tinkering with canned symbols from Micrografx's large library of .DRW format clip art. Unlike the previous version, *Draw Plus* 1.1 can read .DRW files containing Bézier curves, gradients, symbol fills, and masks. This added power gives the program access to all 15,000 images in the Micrografx library. Scalable outline fonts are also now in the program.

To emphasize *Draw Plus*' suitability as a clip-art editor, Micrografx has thrown in 2,200 symbols. Occupying about 6 megabytes of disk space, the symbols range from depictions of computers, businesspeople, and vehicles, to stylized icons of professions and activities.



Draw Plus lets you paste-in symbols from its clip art. You can break images into component objects and scale or rotate them individually.

You also get maps, street signs, electrical symbols, cartoon figures, and ornamental borders and backgrounds.

You can easily paste any of these symbols into your current drawing by selecting from a list of filenames. A hard copy catalog shows you which images reside in each file.

Draw Plus lets you break up images into their component objects. You can scale, move, and rotate objects separately and overlap them. Unlike *Designer*, the program won't let you edit the individual lines that comprise an object. You have some control over coloring Micrografx's mostly black-and-white clip art, but this can be a problematic task.

The interface is similar to *Designer*'s, though some items are missing from the menus and toolbox. You can draw parabolic spline curves, pie segments, and various lines and polygons, or convert line segments into a continuous curve. The Bézier curve tool—a key to *Designer*'s power—is missing, along with CAD features such as layering and snap-to points on objects.

Draw Plus lacks features for autotracing bitmapped images or creating screen shows. There are fewer line styles, fonts, and color palette options. It can't import or export files in bitmapped or CGM formats, and it can only export *Windows* Metafiles.

Draw Plus is easier to learn than *Designer*, and the price is less forbidding. You'll need a third-party file-conversion utility to interact with the larger world of graphics software. But it's a good tool for simple drawing or for negotiating one of the best disk-based libraries of clip art available. ■

List Price: *Micrografx Draw Plus*, Version 1.1, $229. **Requires**: 512K RAM (640K or more recommended), hard disk, *Windows* 2.0 or later, DOS 3.0 or later. Micrografx Inc., 1303 Arapaho, Richardson, TX 75081; (800) 733-3729.

CIRCLE 432 ON READER SERVICE CARD

Whereabouts Lets 'Em Know Where You Are

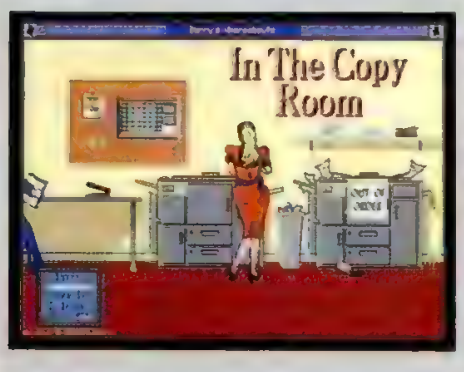
HANDS ON
by Barry Simon

One of the headaches of corporate life is figuring out where your co-workers are when you need them. With *Whereabouts*, a $69.95 program from Mouse Artist Software, you may not be able to locate them any sooner, but at least you'll know what they're up to. How? Their screen displays a prominent, graphic message detailing their whereabouts.

Each of *Whereabouts*' two volumes lets you display 11 messages replete with whimsical graphics. Messages such as "At Lunch" or "At the Copier" are self explanatory. Others, like "Call me at Extension . . ." require customized information. You're allowed to add two lines of text. Many of the graphics have bits of animation, like beads of condensation running down a soda can.

Anyone stopping by your PC can enter a message. You can password-protect these messages, print them, or save them to disk.

A $27.95 starter package includes noncustomizable messages only; the $69.95 *Deluxe* package includes a built-in scheduler. If you have several things to do while you are away, you can have your *Whereabouts* message changed at the proper time. A 7K TSR (1.5K with EMS) will run the scheduled messages automatically.



They'll always know where to find you if you let *Whereabouts* post its whimsical messages on your PC.

The only complaint is that the message editor is primitive. It has no word wrap and few options for text placement. Also, the vendor's logo appears whenever you invoke the TSR.

Whereabouts is an integral part of PC Magazine Labs—where reviewers often saunter away from their dedicated machines. The program is fun and useful and will be invaluable in many organizations. ■

List Price: *Whereabouts Deluxe*, Version 2.01, $69.95 for either Volume 1 or Volume 2, $99.95 for both volumes; *Whereabouts* entry level: Volume 1 without customized text, messages, password protection, or scheduler, $27.95; *Munch Menu* (additional At Lunch graphics) $14.95. **Requires**: 640K RAM, 1MB of disk space per volume with EGA/VGA (less with Hercules or CGA); graphics monitor (Hercules, CGA, EGA, VGA); DOS 2.1 or later. Mouse Artist Software, 45 Lakeside Ave., #38, Marlboro, MA 01752; (800) 366-6873, (508) 485-9530.

CIRCLE 434 ON READER SERVICE CARD

THE CHALLENGE

- To **Share Printers** with up to **16 PC's, Laptops, and PS/2's.**
- To **Transfer Files**, and send **E-Mail** in background mode at 500,000 bps.
- To find the **Most Flexible Topology** for easy wiring.
- To choose a **Low Cost, Easy to Use** product.

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THE PRINTER SHARING SOLUTION YOU'VE BEEN WAITING FOR!

This is why 3X Link-16 is right for you:

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CIRCLE 234 ON READER SERVICE CARD

3X USA

One Executive Drive, Fort Lee, NJ 07024

$995 TIGA 34020 Graphics Adapter

HANDS ON
by Matthew J. Ross

High-performance graphics adapters have suffered from high prices and unfriendly proprietary architectures. National Design is changing the rules with a new video adapter based on the Texas Instruments Graphic Architecture (TIGA).

TIGA boards have been available for a couple of years, but at prohibitive costs. At $995, NDI's Volante AT1000 is pursuing not only the high-performance video market but the Super VGA market as well.

The Volante AT1000 is based on the 34020 graphics processor, the second generation of TI's graphic architecture. The 34010 had an internal cache of 256 bytes—in the new 32-MHz processor it is 512 bytes. The bandwidth of the external bus between processor and video memory has doubled, from 16 to 32 bits.

For the end user, this means greater processing power and faster performance even at 1,024-by-768 resolution with 256 simultaneous colors, as shown by PC Magazine Labs' Graphics Performance Tests under *Microsoft Windows* 3.0.

To ensure compatibility, the AT1000 carries a second onboard processor, Tseng Laboratories' ET4000 VGA chip. A second MB of DRAM works with the Tseng chip to support Super VGA resolutions up to 1,024 by 768 pixels with a 256-simultaneous color display.

The Volante's appeal is its performance *and* price. In contrast, NEC's MultiSync Graphics Engine, configured with the 1MB of dual-ported video memory and 768K of dynamic program memory necessary for 256-color support at 1,024-by-768 resolution, carries a list price of $1,499.

NDI's full-length 16-bit board features a full megabyte each of both DRAM and VRAM. For *AutoCAD* users, NDI offers Panacea Computer Graphics' display-list driver for TIGA at $95. While our tests didn't reveal a performance advantage over NEC's adapter within *AutoCAD*, NDI admitted that it has not yet completed optimizing its software.

The Volante AT1000 supports interlaced and noninterlaced monitors up to 1,024-by-768 resolution, as determined by a setup utility. With software, you tell the board whether it will be operating in TIGA or VGA mode, and at what resolution. And in case the performance of the 34020 is not fast enough, the Volante AT1000 supports a memory upgrade to 4MB of DRAM, as well as Texas Instruments' 34082 floating-point coprocessor—all at a price guaranteed to put pressure on the rest of the video market. ■

PERFORMANCE TESTS: NDI VOLANTE AT1000

The 32-MHz 34020 graphics processor from Texas Instruments propels the NDI Volante AT1000 graphics adapter past the NEC MultiSync Graphic Engine and its 50-MHz TI 34010 processor under *Windows* 3.0.

AutoCAD Benchmark Tests

The **Regeneration** test measures the time it takes to regenerate an on-screen .DXF file using *AutoCAD*'s Regen command.

The **Redraw** test, which we ran but do not report, measures the time it takes to redraw the same .DXF file, using the Redraw command. Performance here was too fast to measure.

Graphics Performance Tests for Microsoft Windows

The **BitBlt Alignment** test uses the *Windows* function BitBlt (bit-block transfer) to move a square block of pixels rapidly from one location to another. We are reporting the results for BitBlts configured as 256-by-256 pixels, using the Source Not Aligned and Destination Not Aligned options for a worst-case scenario. In this case, alignment means that the bits describing each row of the bitmap begin on an 8-bit boundary—the start of a byte.

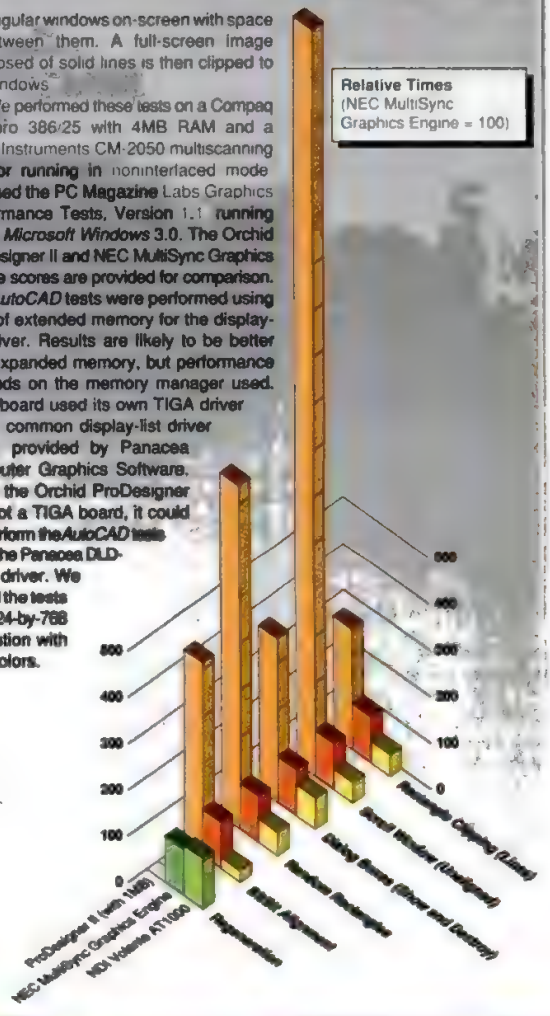
The **Random Rectangles** test draws randomly sized rectangles in random colors.

The **Dialog Boxes (Show and Destroy)** test generates and erases a *Windows* dialog box 20 times.

The **Scroll Window (Unaligned)** test scrolls unaligned text vertically through a rectangular window.

The **Rectangular Clipping (Lines)** test for *Windows* creates four separate, equal, rectangular windows on-screen with space in between them. A full-screen image composed of solid lines is then clipped to the windows.

We performed these tests on a Compaq Deskpro 386/25 with 4MB RAM and a Seiko Instruments CM-2050 multiscanning monitor running in noninterlaced mode. We used the PC Magazine Labs Graphics Performance Tests, Version 1.1 running under *Microsoft Windows* 3.0. The Orchid ProDesigner II and NEC MultiSync Graphics Engine scores are provided for comparison. The *AutoCAD* tests were performed using 1MB of extended memory for the display-list driver. Results are likely to be better with expanded memory, but performance depends on the memory manager used. Each board used its own TIGA driver and a common display-list driver (DLD) provided by Panacea Computer Graphics Software. Since the Orchid ProDesigner II is not a TIGA board, it could not perform the *AutoCAD* tests using the Panacea DLD-TIGA driver. We ran all the tests at 1,024-by-768 resolution with 256 colors.



Performance Times	AutoCAD Benchmark Tests Elapsed Time (seconds) Regeneration	Graphics Performance Tests for Microsoft Windows Elapsed Time (milliseconds) BitBlt Alignment	Random Rectangles	Dialog Boxes (Show and Destroy)	Scroll Window (Unaligned)	Rectangular Clipping (Lines)
ProDesigner II (with 1MB)	Not applicable	95.56	15.18	751.52	130.57	0.78
NEC MultiSync Graphics Engine	17.34	22.92	4.13	316.47	18.71	0.84
NDI Volante AT1000	18.58	5.43	2.05	212.25	8.15	0.3

FACT FILE

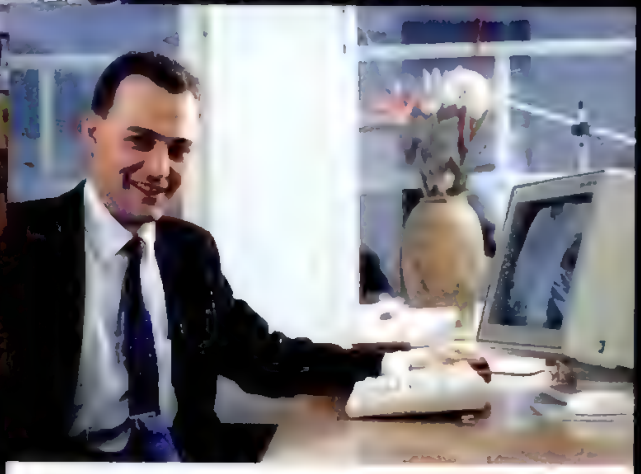
Volante AT1000
National Design Inc., 9171 Capital of Texas Hwy., H-230, Austin, TX 78759; (512) 343-5055.
List Price: With 1MB DRAM, $995. Panacea display-list driver for *AutoCAD*, $95; upgrade to 4MB DRAM, $800; 34082 floating-point coprocessor, $400.
In Short: Price, performance, and VGA compatibility make this TIGA 34020-based board an attractive buy.

CIRCLE 788 ON READER SERVICE CARD

In Gothenburg, Sweden...

You'll find a bustling seaport city, thousands of bicycles, reserved yet friendly people and Gateway 2000 computers.

Anders Bjernefors, a computer dealer and programmer, bought a Gateway 2000 25 MHz 486™ system last April.



Anders Bjernefors, owner of Computer Link AB, and his Gateway 2000 25 MHz 486 computer.

"After many faxes and a lot of study," said Anders, "I selected Gateway 2000. I'm pleased with the machine. I received a very powerful, well-built computer for an astonishingly low price."

Anders was so impressed by his system and by the people at Gateway that he contacted the company about becoming a Gateway 2000 reseller for the Nordic countries of Sweden, Norway, Denmark and Finland. "I telephoned my salesman about a dealership," Anders remembered, "and he told me I'd have to visit the factory to make the arrangements. I was on the next plane out of Göteborg on my way to North Sioux City, South Dakota."

Today, Anders's company, Computer Link AB, sells and services Gateway 2000 products.

Although Gothenburg – or Göteborg in Swedish – is as far north as Siberia, warm ocean currents give the city a mild climate. Residents swim in the North Sea all summer long.

GATEWAY2000

486 is a trademark of Intel Corporation.

And in Worland, Wyoming...

You'll find yourself in the hub of the Big Horn Basin, surrounded by some of the most spectacular scenery in the western United States. You'll see sugar beet farms, petroleum wells and Gateway 2000 computers, too.

Bob Borst, owner and operator of Cloud Peak Pest Control in Worland, spent two and a half months researching his computer purchase. He chose a Gateway 2000 386SX.

Bob Borst, owner and operator of Cloud Peak Pest Control, and his Gateway 2000 386SX.

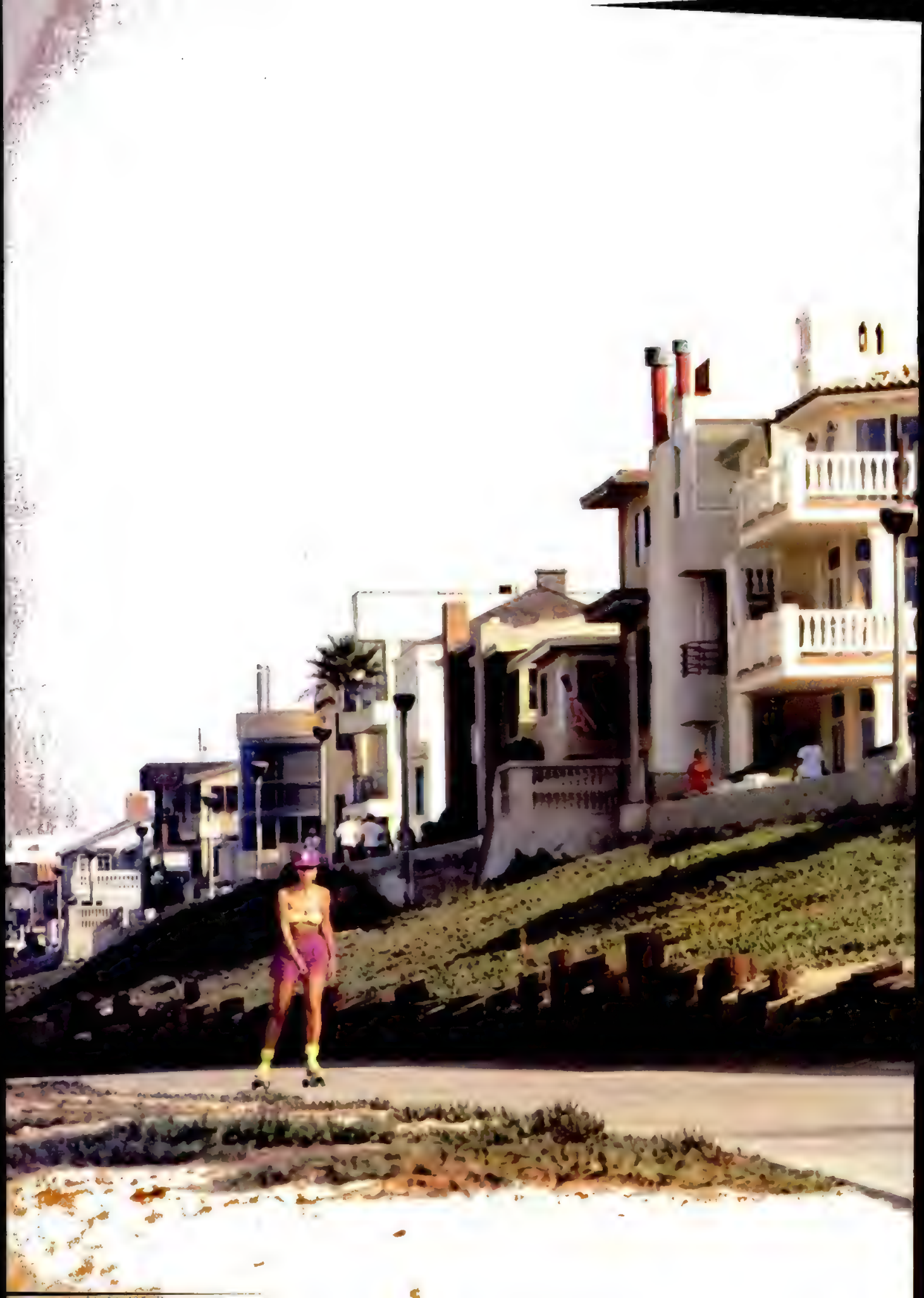
"My final decision was based on people, not hardware," said Bob. "The Gateway people make you feel like you're the most important person in the world. I didn't buy a computer – I bought Gateway."

Bob was equally impressed by Gateway's service people. "One time I got into a file and couldn't get out of it," Bob related. "Even though they're not responsible for software problems, I called Gateway and they talked me through it."

Bob said he'd like to work for Gateway 2000 — and he already has experience in sales. When Bob received his computer, he showed it to his friend Kip who decided to buy one too.

Worland is near Yellowstone, the country's oldest and most famous National Park. Yellowstone Lake is just one of a thousand awesome sights in this treasured preserve.

GATEWAY2000



In Manhattan Beach, California...

You'll find refreshing ocean breezes, seaside skaters, more surfers and another indestructible Gateway 2000 computer.

After the firemen left Bob Baskerville's charred office building, the co-owner of MMB Development Corporation was reluctant to see what was left of his computers. MMB is a software development company best known for TEAMate™, a UNIX™ bulletin board program. The computers, including Bob's Gateway 2000 33 MHz 386 system, were water-damaged and covered with "black gunk."

Bob Baskerville, MMB Development Corporation, and the Gateway 2000 33 MHz 386™ computer that survived the fire.

"My partner and I took each machine apart," recalled Bob, "washing the components and drying them with freon. One of the few systems to survive this risky procedure was the Gateway – and it's still purring along today as if nothing happened." MMB recovered from the June fire equally well. In October, Release 1.8 of TEAMate was shipped on schedule.

Bob said he lost all of his system manuals in the blaze. When he called Gateway 2000 and explained what happened, the company promptly sent new manuals free of charge.

The ocean-front, called The Strand, is a popular spot for Manhattan Beach skaters, bikers and joggers.

In Somerset, England...

A two-hour journey west from London, you'll find lush green meadows sprinkled with wild flowers, stone fences, red-jacketed hunters on horseback and Gateway 2000 computers.

This picturesque place is the home of Len Jones, Managing Director of Data Encryption Systems Ltd. and Gateway 2000 customer. Len operates his company, which provides software protection devices, from his 150-year-old country home located between Cannington and Bridgwater. He uses three Gateway computers in his business – a 25 MHz 386 and two 33 MHz 386 systems.

Len Jones, Data Encryption Systems Ltd., and his Gateway 2000 25 MHz 386 system.

"I looked into three or four American computer companies before I decided to buy a Gateway 2000," Len commented. "When I compared features and prices, Gateway offered the best value. And," he continued, "I liked the selection of systems the company offered."

Len also talked about his initial reluctance to buy a mail order computer. "Europeans are not accustomed to buying through direct mail," he commented. "But I developed a good relationship with my Gateway sales representative and I feel quite comfortable doing business this way now. I've recommended Gateway to a number of people here in the UK."

The London Tower Bridge across the River Thames represents Victorian architecture and engineering at its best.

GATEWAY2000

And in Socorro, New Mexico...

You'll find the New Mexico Institute of Mining and Technology, a small but rigorous school known for science and engineering programs, and Gateway 2000 computers.

Gordon Kane, Laboratory Associate in the Electrical Engineering Department, runs

Gordon Kane, New Mexico Tech Laboratory Associate, with his Gateway 2000 286 lab computers.

student laboratories with 15 Gateway 286 computers and a growing number of Gateway 386 computers.

"We decided to use a modern, PC-based approach for teaching digital and microprocessor electronics," said Gordon. "The quality of Gateway's equipment and their low prices led us to purchase the Gateway computers. This, and the quality of their service, has caused us to continue purchasing computers from Gateway."

New Mexico Tech also uses a Gateway 386 cache computer in research to develop a real-time processor and display system for a sophisticated dual-polarization radar.

"The radar and computer will be used at Kennedy Space Center next summer," said Gordon, "as part of a large program of

People the World Over

Everywhere you look these days you'll find Gateway 2000 computers. That's because people everywhere know a good value when they see one. In all 50 states and in over 70 foreign countries, thousands of people are comparing price, quality and service – and choosing Gateway 2000. Compare for yourself.

Price

Examine the last page of this ad, where you'll find a concise listing of Gateway 2000's product line, and compare Gateway's features and prices with any other computer manufacturer. Many competitors try to trick you with low prices on stripped-down systems. Others copy Gateway's features and prices but don't tell you they're using fishy components and building their systems in the back of their brother-in-law's bait shop. When you've had enough of the confusion, call Gateway for some straight talk from a knowledgeable sales person. In a direct comparison, Gateway has the best prices.

with pride by one of Gateway's Midwest technicians. As the reviews indicate, the quality of a Gateway 2000 system is comparable to the best PC's on the market.

"One of the few systems to survive (the fire) was the Gateway – and it's still purring along as if nothing happened."
Bob Baskerville

"...the company is committed to improving its product line."
Gordon Kane

Computer Shopper readers voted Gateway 2000's 33 MHz 386 and 33 MHz 486 systems Best Buys of 1990.

Service

Of all the factors to consider when selecting a computer, service is perhaps the most important and the most difficult to judge. When customers talk about Gateway 2000, they invariably mention service.

"The Gateway people make you feel like you're the most important person in the world. I didn't buy a computer – I bought Gateway."
Bob Borst

"Gateway's technical support is superior."

Choose Gateway 2000!

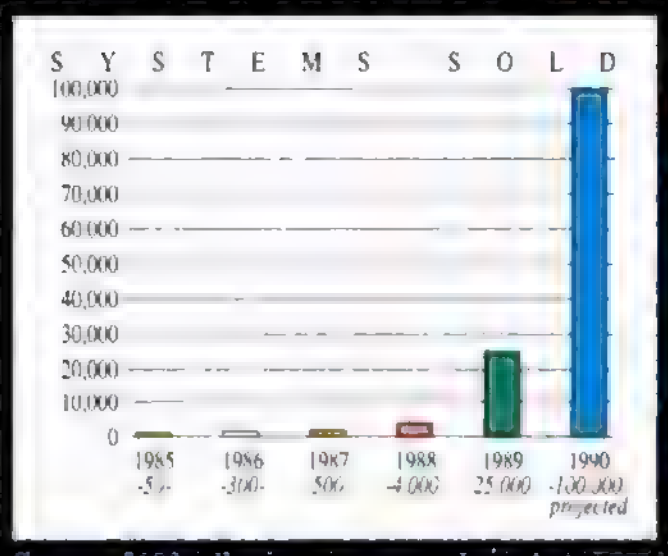
"Gateway shared top billing with such heavyweights as Compaq, IBM, and HP for those who would buy their products again...Overall, Gateway's high marks bode well for the company's future, as does its commitment to customer service."

PC Magazine
September 25, 1990

Success

The combination of price, quality and service makes Gateway 2000 the best value in the industry. But value alone doesn't explain how a little company in the Midwest, just celebrating its fifth anniversary, managed to outdistance hundreds of other companies, selling more systems through the direct market channel than any other PC manufacturer in the country.

"It was the cows," laughed Ted Waitt, Gateway 2000 President and CEO. "Of course." Computer magazine readers will remember that the company's early ads featured a picture of the Waitt family cattle farm with the headline, "Computers from Iowa?"



Gateway 2000 sells more computers through the direct market channel than any other PC manufacturer in the country.

"We can't run that ad anymore," continued Ted, grinning, "because we built a new plant 14 miles down the road in South Dakota. But the cows really worked for us. They made the phones ring. From then on, though, we built our business on value – good prices on quality systems with old-fashioned, personal service."

> "In the computer industry, longevity should be measured in dog years."

Ted mentioned another reason for Gateway's success. "We take a long-term approach to customer service," he said. "When you buy a computer from Gateway 2000, you become part of our family and we're going to be there for you as long as you own that machine."

As Ted talked about the company's fifth anniversary, he laughed again. "In the computer industry, longevity should be measured in dog years," he chuckled, "because everything's moving so fast. That makes Gateway 35 years old! But seriously, we've come a long way in five years. And I owe it all to the great people at Gateway and to our customers."

Dial the Phone

When you add it all up, you'll understand why people the world over choose Gateway 2000. So pick up the phone and dial. Whether you're from Oklahoma or Portugal, North Carolina or Australia, you've got a friend in the business at Gateway 2000.

Gateway 2000 will be there for you 'til the cows come home

GATEWAY2000

"You've got a friend in the business."

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12MHZ 286VGA

- 80286-12 Processor
- 1 MB RAM
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- 14" 1024 x 768 Color Monitor
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- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

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25MHZ 386VGA

- 4 MB RAM
- 1.2 MB 5.25" Drive
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25MHZ 386CACHE

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- 1.44 MB 3.5" Drive
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- 14" 1024 x 768 Color Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

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33MHZ 386VGA

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- 4 MB RAM
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- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16 Bit VGA with 1 MB
- 14" 1024 x 768 Color Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

$3195.00

25MHZ 486VGA

- 64K Cache RAM
- 8 MB RAM
- 1.2 MB 5.25" Drive
- 1.44 MB 3.5" Drive
- 200 MB 15ms IDE Drive with 64K Multi-Segmented Cache
- 16 Bit VGA with 1 MB
- 14" 1024 x 768 Color Monitor
- 1 Parallel/2 Serial Ports
- 101 Key Keyboard
- MS DOS 3.3 or 4.01
- MS WINDOWS 3.0

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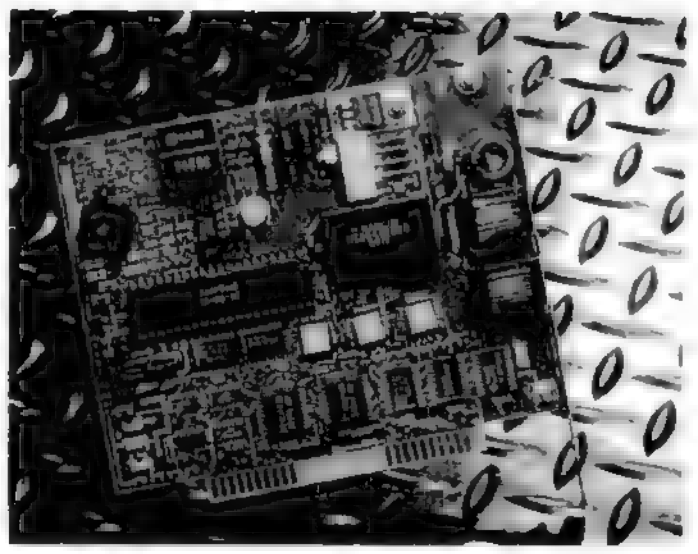
FLYP 96: A Fax Board That Acts like a LaserJet II



The FLYP 96 lets you send faxes without leaving your application. It emulates the native fonts in the HP LaserJet Series II.

HANDS ON
by Edward Mendelson

Virtually all fax boards that let you send faxes from within an application make you format your files as if you were printing them on an Epson dot matrix printer. If your own printer is a LaserJet, the faxes you send will look different than the page you print and preview at your own printer. 3XUSA's $495 FLYP 96 fax board solves that problem.

The FLYP 96—the initials stand for Fax Like You Print—is an 8-bit half-length card that fits in any XT or AT slot. You plug it in, connect the phone wire, and load either a massive 65K TSR that sends faxes in the background or a 20K TSR that captures faxes from your applications to send later.

When ready to send a fax, you press a configurable hotkey that pops up a menu where you can either enter a phone number or choose one from your directory. The next time you print from your application, the TSR captures the output to the LaserJet and redirects it to the fax board, translating it into fax format in the process.

FLYP emulates the native fonts in the LaserJet Series II and lets you supplement them with any bitmapped LaserJet soft fonts. You don't have to download the soft fonts every time you send a fax, because the software captures a font the first time you use it. FLYP's software can't emulate fonts in a cartridge, but if you download soft fonts identical to those in your cartridge, the board's software can use them later.

Installation is straightforward. You don't have to set jumpers unless the board causes a hardware conflict, and nothing is changed in your CONFIG.SYS or AUTOEXEC.BAT files.

In the version I tested, the idea of the FLYP board was more impressive than its execution. The faxes I sent included impressively detailed graphics, but text sometimes lacked underlines, and a line of nonsense characters often appeared at the top of the page. I had no trouble sending faxes to any machine, but the software for viewing received faxes is painfully slow at generating a screen image.

The software has other peculiarities. If you tell your application to use a cartridge font that you haven't downloaded as a soft font, the fax software uses either the default Courier or one of your existing soft fonts. The resulting letter spacing is acceptable, but the word spacing is wildly wrong. Unless you're very careful, you can't be absolutely certain what your faxes will look like.

You can't use the board's TSRs with *Microsoft Windows* 3.0 or *Microsoft Works*, although those problems should be fixed by the time you read this. The software also conflicts with popular utilities like Cove Software's *PCED*.

For all its problems, the FLYP 96 is the only fax board to get if you want to use any bitmapped LaserJet soft font in faxes sent directly from your computer. If you're more interested in reliable operation with low RAM overhead, you'll probably want the Intel Satisfaxtion board instead. ■

List Price: FLYP 96, $495. **Requires**: 65K free RAM for background sending and receiving, one 8-bit slot, DOS 2.11 or later. 3XUSA Corp., One Executive Dr., Fort Lee, NJ 07024; (800) 327-9712, (201) 592-6874.

CIRCLE 703 ON READER SERVICE CARD

UltraStor's ESDI Caching Controller: Speed and Safety at the Right Price

HANDS ON
by Edward Mendelson

UltraStor Corp.'s $695 Ultra 12C caching controller for ESDI hard disks initiates the second generation of caching controllers—those that include a hardware disk cache in their RAM rather than making you use part of your CPU's RAM for a software cache.

Earlier caching controllers (see "Hard Disk Access in No Time Flat," *PC Magazine*, June 12, 1990) offered speed, safety, or economy, but never all three combined.

UltraStor's controller has everything. The board comes with 1MB of RAM cache installed, and it supports up to 16MB in the form of 100-nanosecond 1MB or 4MB SIMMs. You don't have to change any settings when you plug in a new SIMM; the board configures itself automatically.

The controller also supports deferred writes for the fastest possible disk access. An optional battery-powered module (price not yet determined) saves the contents of the cache in case a deferred write gets further deferred by a power failure.

UltraStor's previous ESDI controller, the Ultra 12F, comes with a 32K RAM buffer and is one of the fastest standard ESDI controllers on the market. The 12C is a drop-in replacement, so you can replace the 12F without reformatting your disk or even running DEBUG to adjust the cache settings.

If you're replacing another controller, or installing a new disk, UltraStor's disk preparation menu has fuller options and clearer choices than any other. The controller supports disk mirroring and duplexing under Novell's *NetWare 386*, coexists with a second controller in the same system, runs at bus speeds of up to 16 MHz, and has a 24-MHz processor on-board for managing its cache. All features are available under DOS, OS/2, *Microsoft Windows*, Unix, Xenix, and *NetWare*.

The only inconvenience results from a physical layout where the SIMMs extend over the adjacent slot. This means you can only install a half- or three-quarter-length board next to the controller.

Compared with the same amount of RAM in a software cache like *Super PC-Kwik*, the UltraStor produces increased speeds on PC Magazine Labs' BIOS Disk Seek test, and like results on the small-record DOS File Access test. The software cache produces marginally better results with large records. Applications with small records may get the best results by combining the hardware cache with a small software cache.

For standalone DOS applications, you can get most of the benefits of a caching controller with a good software cache. But for transparent operations, total lack of interference with your CPU's precious RAM, and complete safety in networks and standalone machines, UltraStor's Ultra 12C is the controller to buy. ■

List Price: Ultra 12C with 1MB cache, $695. **Requires**: 16-bit slot in any standard-bus AT-style or 386 computer. UltraStor Corp., 15 Hammond, #310, Irvine, CA 92718; (714) 581-4100.

CIRCLE 436 ON READER SERVICE CARD

Knowledge Seeker:
Statistics for Decision Makers

HANDS ON
by Barry Simon

FirstMark Technologies' $495 *Knowledge Seeker* is a statistical analysis program that attempts to analyze a data set and find those variables that have the greatest effect on a chosen dependent variable.

Knowledge Seeker uses a decision tree method—an approach only recently taken out of academia's ivory towers more traditional statistical packages rely on normal (Gaussian) distributions.

Decision tree methods depend on the calculational ability of computers. A typical problem might concern a hospital cardiac unit trying to identify those classes of individuals most likely to have a second heart attack within 24 hours of admission. The hospital collects data on past histories and possible critical factors. The decision tree method partitions the data based on every possible factor. It chooses the variable with the highest predictive probability.

The term "decision tree" is used because each node of the initial split can be split further, looking for significant secondary factors. The results of this method might end up singling out those patients over 60 and those under 60 years of age who smoke a pack of cigarettes a day. The tree can be grown to additional levels identifying tertiary (and further) factors.

Knowledge Seeker lets you hand-enter data or import from *dBASE*, *Lotus 1-2-3* worksheets, or ASCII files. You specify the dependent variable and the program will form a decision tree one level at a time, or across an entire tree. If the determining factor for the split at a given level is a close one, you can cycle through other significant choices.

The program is solid, but it is marred by several factors: TSR conflicts, a weak user interface, and too simplistic a presentation. *Knowledge Seeker* crashed in my admittedly complex normal environment, so I had to reboot with a plain-vanilla setup to run it.

The user interface has weak spots. For example, you can set screen colors only by editing an ASCII file. Main menu choices and many submenu options can be chosen only with arrow keys or the mouse; first letters don't work.

A more fundamental problem is that statistical tools should be used cautiously. This program may give *Knowledge Seeker*'s conclusions more credence than they deserve. Clearly, you use the program hoping to find that B causes A. The manual adds fuel to this fire by stating that with a significance level set to 5 percent, "you only expect to be wrong five times out of a hundred." In fact, since statistics can report only on correlations, not on causes, there is a chance you could be misled.

This "trust me" attitude is exacerbated by the manual. Gobbledygook such as "the partitions formed in the exhaustive method are stronger empirically than those formed using the heuristic method" is a poor excuse for an explanation.

If you need to find statistically significant factors, you'll want this program, but you'll have to put up with some awkwardness, and you'll have to respect the shortcomings of decision-making analysis. ■

List Price: *Knowledge Seeker*, Version 2.0, $495. **Requires**: 640K RAM, DOS 3.2 or later. FirstMark Technologies Ltd., 14 Concourse Gate, #600 Ottawa, Ontario, Canada K2E 7S8; (800) 387-7335.

CIRCLE 706 ON READER SERVICE CARD

***Knowledge Seeker* will take a dependent variable and seek out the statistically most significant correlated factor.**

Control Pak/W: Reusable Software Objects for Windows

HANDS ON
by Richard Hale Shaw

Creating and customizing your own controls—scrollbars, buttons, combo boxes, and so on—is difficult. That the built-in *Windows* controls don't always provide what your application needs compounds the problem.

Sage Software's $595 *Control Pak/W* consists of six predefined reusable and modifiable software objects, replete with their own C source code. They're ready-to-go additions to your *Windows* applications, and using them can save a lot of development time.

In *Windows* programming, every object is a window, each with its own class definition.

You can subclass a control to give it additional characteristics and behaviors, but that's not a good solution if the control must look or behave differently.

Control Pak/W's controls include an arrow control with a configurable pointer, tail direction and shadow control; a picture control to display bitmaps and metafiles in customizable window frames; a ruler control to let users place and measure objects on-screen; a scrollbar control to display a value on the slider graphically; a toolbox control to allow users to select icons and change an application's operation; and a button control for creating custom buttons. The program also offers an excellent step-by-step tutorial explaining how all controls work, how to use them, and how to roll your own.

Each *Control Pak/W* control has a sample program that illustrates how the control is called and used in an application. You don't have to compile the controls in their original form since the dynamic link libraries (DLLs) are available. You don't have to wait until programming is complete to try out a new control either, since a Control Tester is included. By running *Windows* with the Tester you can test each control as if an application were already using it.

The program is a little pricey, but you can't beat the quality of the tutorial or the included source code. And there are no royalties on software that uses *Control Pak/W*. If you want to create your own controls, and control subclassing isn't an appealing solution, you should pick up *Control Pak/W*. ■

List Price: *Control Pak/W*, Version 1.2, $595, pack of 3 controls with testers, $295. **Requires**: 640K RAM, mouse, Microsoft C 5.1 or later, *Windows* 3.0 or later, *Windows* SDK 3.0 or later, DOS 3.31 or later. Sage Software Inc., 1700 NW 167th Pl., Beaverton, OR 97006; (800) 547-4000.

CIRCLE 781 ON READER SERVICE CARD

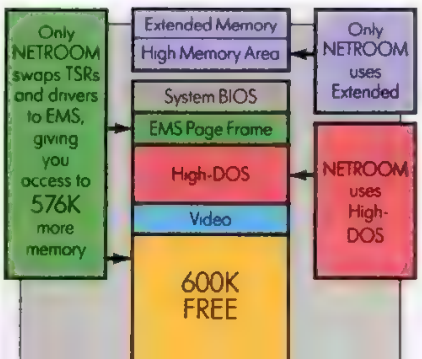
Quick, name the world's best memory manager:

Wrong!

If you answered QEMM® or 386MAX®, you're wrong. Because now **NETROOM®** outperforms both – and at a better price too!

You see, **NETROOM** is more than a great LAN manager. It is a full-featured memory manager that completely relocates LANs (like Novell, VINES®, etc.), device drivers, and TSRs to extended, expanded, and High-DOS memory.

And, **NETROOM** rubs out the competition in more ways than one – by giving you access to 576K more memory than QEMM, as well as working on all PCs (8088 through 80486), and in all areas of memory (see chart). In fact, you could say the competition pales in comparison!



Features:	NET-ROOM	QEMM	386 MAX
Windows 3.0 support	✔	✔	✔
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Relocates to High-DOS	✔	✔	✔
Relocates to LIM 3.2 Frame	✔		
Relocates to Expanded	✔		
Relocates to Extended	✔		
Works on 386/486	✔	✔	✔
Works on 8088/286	✔		
Memory Analysis Utility	✔		

And to top it all off, with **NETROOM** you get absolutely FREE – **DISCOVER®**, a full-featured analysis

know about your machine and its memory.

Remember, when it comes to memory management, there's only one correct answer – **NETROOM**.

Requirements: A 386, or some EMS 3.2 or EMS 4.0 memory hardware, or at least 64K extended memory.

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Then ask us about our new 386/25 and 386/33 systems. The list of standard features includes the latest that high technology has to offer. Like a 64 KB memory cache for the 386/25, and 128 KB for the 386/33, both expandable to 256 KB. Then there's the integrated VGA controller supporting 1024 x 768 resolution, with 256 vibrant colors and a 50% performance increase all made possible by 1 MB of 32-bit video memory. Plus support for interlaced and non-interlaced monitors. When it comes to features, we set the standard.

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- ☐ Super Hi-Res 14″ VGA color monitor with tilt/swivel base
- ☐ 105MB IDE hard drive with Cache buffer
- ☐ 1.2MB 5.25″ and 1.44MB 3.5″ floppy drives
- ☐ 1 parallel and 2 serial ports
- ☐ 101-key enhanced keyboard
- ☐ MS DOS 4.01
- ☐ Microsoft Windows 3.0
- ☐ Hi-Resolution mouse
- ☐ Free one year on-site service

386▼33 with 128K Cache Memory	386▼25 with 64K Cache Memory
$2995	$2695

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No one can beat our flexibility either. An integrated floppy controller and hard disk interface that support up to three floppy drives and two hard drives. Up to 16 MB of RAM on board using the new industry standard 32-bit memory modules leave all six expansion slots available.

Our small footprint chassis includes both 5.25″ and 3.5″ floppy drives and 1 parallel and 2 serial ports. And consider this feature, our new 386/25 and 386/33 systems come standard with 5 drive bays to hold up to one additional floppy drive or tape backup and 2 hard drives. So, we can help you add on and update to your heart's content.

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- ☐ 1.2MB 5.25″ & 1.44MB 3.5″ floppy drives
- ☐ 1 parallel and 2 serial ports
- ☐ 101-key enhanced keyboard
- ☐ MS DOS 4.01
- ☐ 386/SX includes Windows 3.0 and mouse
- ☐ Free one year on-site service

386▼SX only $1895.00	286▼16 only $1595.00

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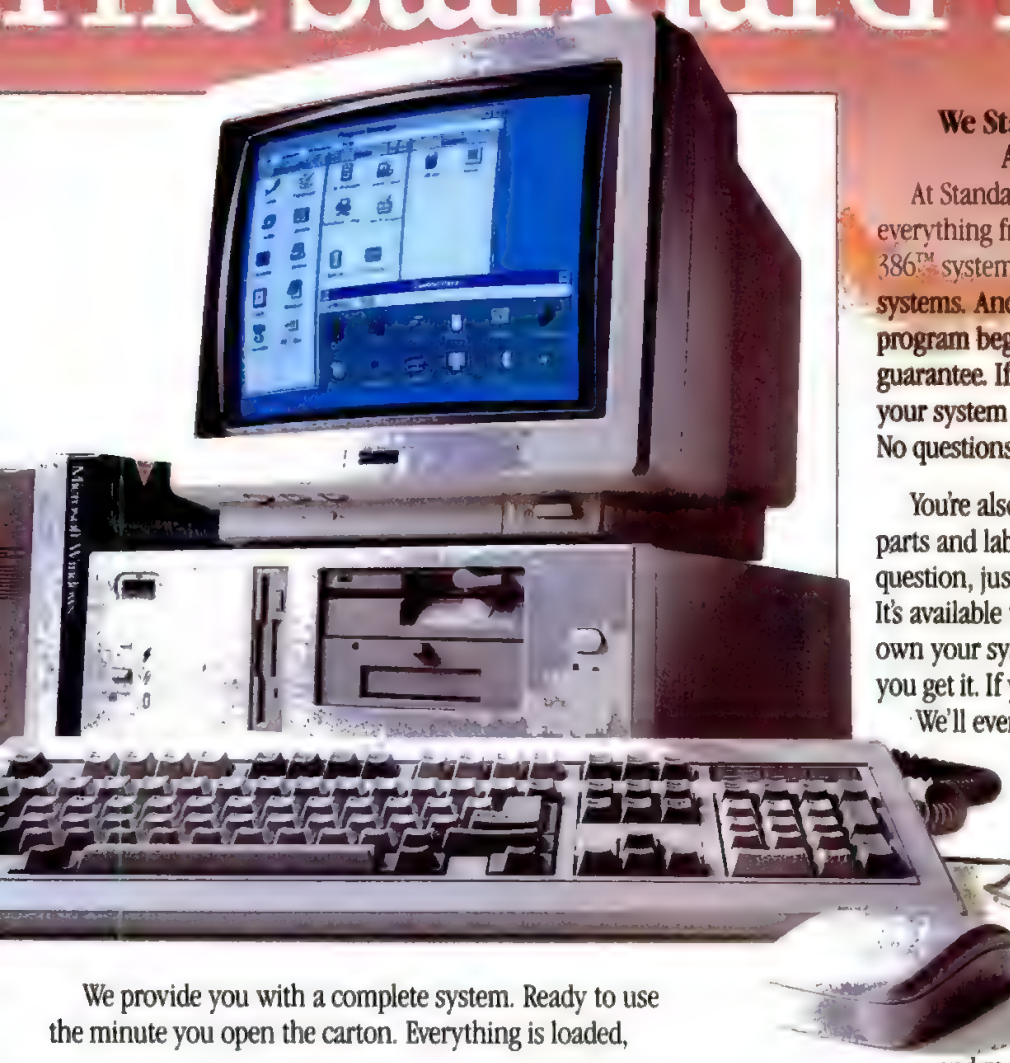

We Stand Behind Our Systems And Our Customers.

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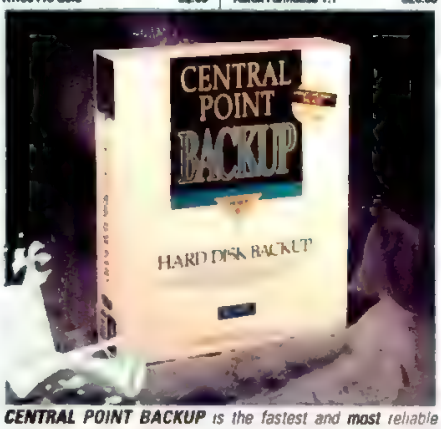

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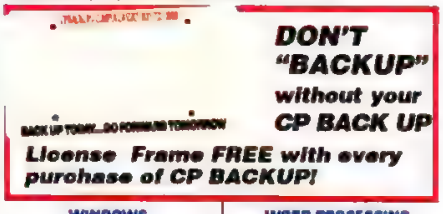

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by
Cristina Cordova
and Nate Zelnick

New & Improved

News of Announced Products and Upgrades

New Tandy SX Features Super VGA Graphics

NEW

Tandy Corp. announces a 20-MHz 386SX computer for $2,499. Measuring 4.25 by 15.5 by 15 inches (HWD), the Tandy 4020 SX features 2MB RAM expandable to 16MB, a high-density 3.5-inch floppy disk drive, built-in 16-bit Super VGA graphics, 100-watt power supply, three 16-bit ISA expansion slots, serial and parallel ports, and a mouse port. With the built-in graphics, the 4020 SX offers 640-by-400 resolution with 256 colors, and users can expand video memory from 256K to 512K for 640- by 480- by 256-color resolution or 16-color support at 1,024-by-768 resolution. The 4020 SX has enough for one 3.5-inch low-profile hard drive, and one 5.25-inch half-height drive bay which can accommodate a 17-ms. IDE hard disk drive in either 52- or 105MB capacities. The 4020 SX also supports the small computer system interface (SCSI) and has FCC Class B certification.

List Price: Tandy 4020 SX, with 2MB RAM, high-density 3.5-inch floppy disk drive, $2,499. Tandy Corp., 700 One Tandy Center, Fort Worth, TX 76102; 817-390-3011.

CIRCLE 440 ON READER SERVICE CARD

Raster-to-Vector File Conversions

NEW

If you need to use scanned images for CAD/CAM or graphics applications, Envisions Solutions Technology has a new raster-to-vector conversion program—*Envision It*. *Envision It* combines tracing, shape recognition, and raster-to-vector conversion routines to turn bitmapped or binary images into vector images composed of lines.

These vector files are compatible with most drawing and CAD software packages. *Envision It* identifies circles and arcs as a single entity, instead of a series of short, straight vectors, resulting in smaller file size and smoother output. The drawing editor, which operates in a pull-down menu interface, includes hatching and paint functions. *Envision It* is designed to write plot commands to disk and supports most file formats, including TIFF, HPGL, *GEM*, *AutoCAD*'s .DXF, .PCX, and .EPS formats. A Microsoft-compatible mouse is recommended.

The advantage of *Envision It*'s arc identification is seen here in the "P".

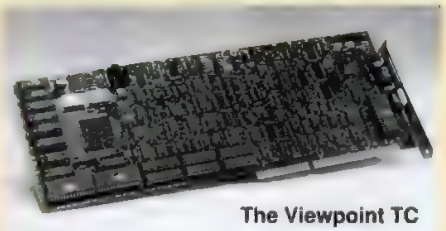
List Price: *Envision It*, $399. **Requires:** 512K RAM, hard disk, a graphics display card, DOS 2.0 or later. Envisions Solutions Technology Inc., 822 Mahler Rd., Burlingame, CA 94010; 800-321-3689 or 415-692-9061.

CIRCLE 441 ON READER SERVICE CARD

HOT PROSPECT

EVEREX VIDEO ADAPTER SHOWS TRUE COLORS

Until recently, users who needed to display true color (16.8-million colors) found themselves facing two not-so-appealing choices: Purchase a high-priced Targa board and custom monitor, or do without true color. **Everex Systems** hopes to eliminate this problem with the introduction of their Viewpoint TC board.



The Viewpoint TC VGA graphics card displays up to 16.8 million colors.

Priced at $795 with 1MB DRAM, the Viewpoint TC is a VGA graphics card capable of displaying up to 16.8 million colors in 24-bit mode, or 32,768 colors at 16 bits per pixel. The Viewpoint TC operates in either 640-by-480 or 512-by-480 resolution with any standard VGA monitor. The Viewpoint TC supports a variety of software packages including *Windows* 3.0, OS/2 Presentation Manager, *GEM*, *Ventura Publisher*, and *AutoCAD*.

Everex also has announced an alternative to specialized broadcast video boards. The Vision VGA HC is a noninterlaced VGA to NTSC graphics board capable of recording VGA text and graphics onto video tape in 32,768 colors. The $715 Vision VGA features 1MB of DRAM and supports applications with resolutions ranging from standard VGA to 1,280 by 1,024 by 16 colors. The Vision VGA HC features an antiflicker filter, multiple format recording in composite, RGB component, or S-video, and is available in either NTSC or PAL standards.

List Price: Viewpoint TC, $795. Vision VGA HC with 512K RAM, $615; with 1MB RAM, $715. Everex Systems Inc., 48431 Milmont Dr., Fremont, CA 94538; 415-498-1111.

CIRCLE 439 ON READER SERVICE CARD

LAN Watch Secures Your Network

NEW

Designed as a network security system, **Zaron Software**'s *LAN Watch* provides complete PC and network security by implementing restricted passwords and assigned security levels. *LAN Watch* consists of four separate programs: Logon, Setup, Report, and Password. The 17K RAM-resident Logon program provides log-on/log-off capabilities with password checking and allows users to log off while executing a program. Setup defines new users, passwords, rights, and restrictions to the system. The Report program records all log-on activity including: dates, users, program, and file use, while Password allows each user to change his/her password.

A full record of log-on activity reveals

CONTINUES ON PAGE 56

equipment utilization, program use, a list of currently active users, and a file log indicating which user was the last person to work on a given file and the time the last changes where made. *LAN Watch* also has a job-accounting feature which provides job totals and the time each user spends on a job. It logs off automatically after a specified time period of inactivity. **List Price:** *LAN Watch*, $495 per network server (up to 99 workstations) or $95 per individual PC. **Requires:** 17K RAM per workstation, hard disk, DOS 2.1 or later. Zaron Software, 13100 Dulaney Valley Rd., Glen Arm, MD 21057; 800-669-3348 or 301-592-3334.

CIRCLE 442 ON READER SERVICE CARD

Datasouth Corp. Offers High-Speed Printing

NEW

Datasouth Corp. has begun shipping the Performax A600, the first in a series of high-speed serial dot matrix printers designed as an alternative to low-end line printers. The Performax A600 handles large-volume network printing of a variety of documents including invoices, payroll checks, and labels. Additionally, the Performax A600 has a straight paper path for accurately printing multipart forms. With a draft speed of 622 characters per second, the Performax can handle up to 20,000 printed pages per month. Features include: an 18-wire printhead; tractor (and optional friction) paper feed; demand document capability to allow forms access; and four programmable profiles to configure the print style, speed, and forms formatting. The Performax also has DEC LA 120, Epson FX, and IBM Proprinter emulations, ASCII connectivity through serial and parallel ports, as well as connectivity to IBM S/3X-AS400 (twinax) and IBM 3270 (coax) environments.
List Price: Performax A600, $2,695. Datasouth Computer Corp., P.O. Box 240947, Charlotte, NC 28224; 800-476-2120 or 704-523-8500.

CIRCLE 443 ON READER SERVICE CARD

Eclin Introduces Low-Cost Full-Function PC Communications

NEW

Eclin Technology introduces a low-end communications package designed to bring advanced capabilities to the nonpower user. *Eclin Connect* features point-and-shoot menus, mouse support, a phone book, a usage record, an integrated text editor, background file transfer, customizable printer support, context-sensitive help, and a script language complete with script recorder and debugger. *Eclin* also features percentage bars, status indicators, and shortcut keys to all major functions. Historical tracking allows the user to view previously selected options. The phone book stores system descriptions, phone numbers, communications settings, terminal settings, and script file names. Each entry includes the summary that displays total usage (hours, minutes, and seconds), last call (date and time), and total number of calls. Built-in safety features protect users against incomplete entries and missing script files. *Eclin Connect* automatically adjusts baud rates to match answering computers, and automatically updates the phone book entry with the correct setting. File-transfer protocols include Xmodem, Ymodem, Xmodem-CRC, Ymodem-Batch, and ASCII. **List Price:** *Eclin Connect*, $49. **Requires:** 384K RAM, Hayes compatible modem, DOS 3.0 or later. Eclin Technology, 172 W. State St., P.O. Box 2041, Trenton, NJ 08607; 609-393-0577.

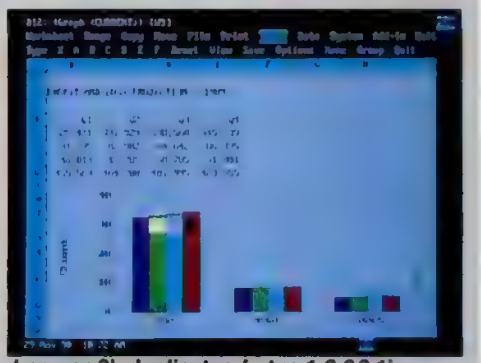
CIRCLE 444 ON READER SERVICE CARD

CONTINUES ON PAGE 58

IMPROVED

***The Frye Utilities for Networks*, Version 1.05**—Frye Computer Systems has upgraded its network management utilities to support *NetWare 386*. Version 1.05 of the *Frye Utilities for Networks (FUN)*, $495 (additional server licenses—$150), includes utilities for configuring nodes, workstations, and bridges, diagnosing packet errors, creating printer queues, and generating diagnostic reports. An additional feature now provides integrated on-line help. Frye Computer Systems of Boston, Mass., can be reached at 800-234-3793.

***Impress*, Version 2L**—Though already bundled with *Lotus 1-2-3* 3.1, PC Publishing's WYSIWYG text/graphics spreadsheet presentation enhancement module is now available as a separate product for *Lotus 1-2-3* 2.*x* users. *Impress* turns *1-2-3*, Release 2.*x* into a graphical spreadsheet with its text and live graphs mixing, drawing tool, page compression, Bitstream fonts, and mouse support. *Impress* can now duplicate the *1-2-3* 3.1 command structure or, for users familiar with previous versions of *Impress*, revert to its original interface. Format and data files created with *Impress* 2L are fully compatible with *Lotus 1-2-3* 3.1. The $149.95 add-in is available from PC Publishing in Los Angeles, Calif., at 213-556-3630.



***Impress* 2L duplicates *Lotus 1-2-3* 3.1's graphical interface for *1-2-3* 2.*x*.**

***ToolBook for OS/2*, Version 1.0**—Asymetrix Corp. now offers cross-platform, object-oriented, graphically based software development for OS/2. *ToolBook for OS/2* maintains the easy-to-use interface of its *Windows* version, offering tools that include color drawing, hypernavigation, animation, flat-file database creation, and OpenScript—*ToolBook*'s object-oriented programming language. In addition, support for most *Windows* and all OS/2 dynamic link libraries (DLLs) is provided. The OS/2 version is compatible with *dBASE* files, includes a hypermedia tutorial, and has a business calculator, an animation primer, an on-line tour of *ToolBook* features, sample scripts, clip art and page designs, and DayBook, a complete personal information manager (PIM). Applications developed in *ToolBook for OS/2* are file-compatible with *ToolBook for Windows*. The package retails for $395, and is available from Asymetrix Corp. in Bellevue, Wash., at 206-462-0501.

***CA-SuperProject*, Version 2.0**—Computer Associates' $895 project management package adds WYSIWYG reporting, a GUI look, improved graphics, and import/export features. Pull-down menus, pop-up dialog boxes, mouse support, an assist mode, and a customizable feature set simplify project tracking and analysis. In addition, Version 2.0 adds direct import/export of SYLK and fixed ASCII to its roster of supported formats, as well as links to other third-party products such as *Time$heet Professional*. Computer Associates' SupportPlus maintenance-plan subscribers and those who buy *CA-SuperProject*, Version 2.0, before May 5, 1991, will receive the upgrade free. All other registered users may receive *CA-SuperProject*, Version 2.0, for $195. Contact Computer Associates International Inc. of San Jose, Calif., at 800-531-5236.

CONTINUES ON PAGE 58

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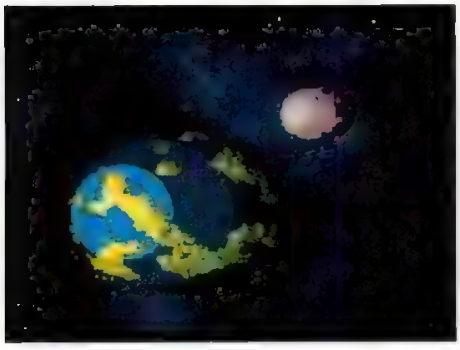
† Includes $100 worth of slide processing from Brilliant Image * 100 color CGM clip art images from MGI. Bitstream® headline fonts. 4 color Quattro Pro slide show presentation guide and power presentation macros.

Tardis Creates Multidimensional Fractal Imaging

NEW

FRACTEDT, a new graphics software package from **Tardis Systems**, provides tools for scientists and engineers as well as PC users with active imaginations. By combining image processing and fractal geometry, *FRACTEDT* enables the user to create and control multidimensional images such as plants, maps, landscapes, planets, strange galaxies, and other intricate designs.



***FRACTEDT*'s Planet algorithm allows you to project binary image files onto spheres.**

FRACTEDT integrates four fractal images with five image-processing utilities—all of which were developed through the use of FORTRAN and Microsoft C and use the Oakland Group CSCAPE windowing interface. The fractal images, L SYS, CHAOS, FBM, and PLANET, are design options. They enable sculpting of fractal curves. The image-processing utilities, DISPLAY, VIDTST, IPU, 3DP, and READ, serve as a controlling device over the sculpted image.

Work can also be done on multiple images; this includes colorings, rotation, sliding, zooming, shading, and Boolean operations. These functions allow you to manipulate technical data and create a variety of display, processing, and analysis schemes. *FRACTEDT* uses a number of computer algorithms—each creating, operating, or processing a standard binary image file. Tardis Systems recommends an EGA or VGA display in order to get the best results.

List Price: *FRACTEDT*, five-disk set (two demo disks, two program disks, and one documentation disk), $69.95; two demonstration disks, $5. **Requires:** 512K RAM, DOS 2.1 or later. Tardis Systems Inc., 945 San Ildefonso, #15, Los Alamos, NM 87544; 505-52-9401.

CIRCLE 445 ON READER SERVICE CARD

NCR Offers The OS/2 Workgroup Platform

NEW

NCR Corp. announces a suite of OS/2-based products designed to provide a client-server base for distributed applications, data, and resource sharing across networks. The *NCR Communications Server* expands the reach of OS/2 and DOS workstations by giving access to corporate resources in a hierarchical or peer SNA network. The *NCR Communications Workstation* provides the same capabilities to a standalone OS/2 workstation. NCR's OS/2 1.21 provides a server platform by supporting multiple concurrent tasks. *NCR LAN Manager* 2.01 links DOS and OS/2 workstation users into logical workgroups by connecting workstations and servers. *NCR SQL Server* 1.1 expands the data sharing potential of the workgroup by providing mainframe-class SQL database services on the network to DOS and OS/2 workstations.

List Price: NCR OS/2, Version 1.21, $340; *NCR LAN Manager*, Version 2.01, $595; *NCR SQL Server*, Version 1.1, $795 plus $80 per-PC charge; *NCR Communications Server*, $795 plus $80 per-PC charge; *NCR Communications Workstation*, $495. NCR Corp., Dayton, OH 45479; 513-445-4732.

CIRCLE 446 ON READER SERVICE CARD

POWERtranslate Breaks The Language Barrier

NEW

Performance Technology has developed *POWERtranslate*—a tool that facilitates the translation of software into different languages. *POWERtranslate* creates a database of readable text within a given program; any database may contain several different translations. A side-by-side translation process makes it possible for the user to complete the database. *POWERtranslate* then incorporates the translated text from the database into the original software. This procedure, which requires no recompiling or language expertise, ensures maintenance of the program's integrity.

In addition, Performance Technology offers a *POWERtranslate Distribution Kit*. This enables a vendor to use the *POWERtranslate* program to create a database containing several different translations of a particular software product. With this database and a *POWERtranslate* module, the user chooses which language he or she wants at the prompt.

List Price: *POWERtranslate*, $595; *POWERtranslate Distribution Kit* License, $4,995 annually. Performance Technology, 800 Lincoln Center, San Antonio, TX 78230; 800-825-LANS or 512-524-0500.

CIRCLE 447 ON READER SERVICE CARD

IMPROVED

CONTINUED FROM PAGE 56

***Reminders!*, Version 3.0**—POP Computer Products' personal information manager (PIM) now incorporates a memory-resident mode for use with text-based programs, its text search utilities, scheduler, schedule-error checking, and autodial capabilities. Additional improvements include mouse support and larger pop-up notepads. The $99.95 program is available from POP Computer Products Inc. of Evergreen, Colo., 303-674-0200.

***PrisMatic PaletteMaker*, Version 1.2**—Eyring's $179 color-reduction system, which can reduce 16-, 24- or 32-bit .TGA files to 256-color files compatible with any VGA system, now includes a zoom function and an "edging" utility to soften contrasting edges in a color-reduced image. Additional utilities include a TIFF 256 to TIFF 16 reduction algorithm for use with *Paintbrush* and a TIFF to Targa converter. Eyring Inc. is located in Provo, Utah and can be reached at 801-375-2434.

***Collage Plus*, Version 3.1**—In response to the weak screen-capture functions of *Windows*, Inner Media now includes a screen-capture utility for that operating environment in its image management program, *Collage Plus* ($129). *Windows*' screens and images may now be saved in .PCX, *Win* 3 .BMP, and black-and-white, dithered gray scale, and true gray TIFF formats. Inner Media of Hollis, N.H. can be reached at 800-962-2949.

***SQLBase Server*, Version 4.1**—The router function in Gupta Technologies' update to *SQLBase* now allows users simultaneous access to local and remote data under *DBWindows*, Gupta's single-user engine for *Microsoft Windows*. In addition, the $1,995 upgrade ($2,495 for the OS/2 version) also adds cursor context preservation for multiwindow applications and improved documentation. Upgrade, $495; free if purchased after October 1. Contact Gupta Technologies in Menlo Park, Calif., at 800-876-3267.

***Baler*, Version 5.1**—Hoping to bring its spreadsheet compiler to lower-end users, Baler Software has added a friendlier face to *Baler*, including mobile pop-up macro menus, contact-

CONTINUED ON PAGE 60

Make Powerful Connections with Borland's New Paradox

By any standard, Paradox® is the most powerful database. That's why it's been rated #1 by every leading computer publication, and why hundreds of thousands of users worldwide have switched to Paradox. Now there's another reason to switch to Paradox—it ***connects.***

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Paradox 3.5 incorporates VROOMM™ and Turbo Drive.™ These proprietary Borland technologies let Paradox automatically optimize your computer's use of available memory, and access up to 16Mb of RAM on 286/386™/486™ PCs. The result is lightning-fast database performance on *any* PC.

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CODE: ME21

*Paradox SQL Link ($495 suggested retail) is an add-on product for Paradox 3.5 and is required to make the connection with SQL servers. **Microsoft, IBM, Oracle and DEC RDB/VMS servers supported now. †Offer also good for owners of any version of R:BASE or DataEase. Proof of ownership (a page from the manual) is required. Satisfaction guaranteed or your money back. Upgrade offer expires March 31, 1991. Upgrade pricing good in U.S. and Canada only. Mail orders to: Borland International, Inc., P.O. Box 660001, Scotts Valley, CA 95067-0001. Add $9.00 for shipping and handling. Residents in CA, CT, GA, IL, MA, MI, MN, NY, OH, PA, TX, VA and WA, please add appropriate sales tax. For orders outside the U.S. call (408) 438-5300. 386 and 486 are trademarks of Intel Corporation. Copyright ©1990 Borland. All rights reserved. BI 1395

New&Improved

Books, Cards, and Labels PrintBase

NEW

Useful Software announces *PrintBase*, a software utility that prints any database application file to paper formats compatible with FiloFax, Day Runner, Day-Timer, Rolodex, Running Mate, and Avery labels. *PrintBase* is completely menu driven, and works directly with any*dBASE* or ASCII delimited file. It also directly supports 400 printers. Besides its telephone and address directory format, *PrintBase* has a general data format to help organize product listings, collections, and libraries. To print with most applications, identify the filename and the desired format, and the software takes care of the rest.

List Price: *PrintBase*, $99.95. **Requires:** 512K RAM, DOS 2.0 or later. Useful Software Inc., 2301 Stokes Canyon, Calabasas, CA 91302; 818-880-4001.

CIRCLE 448 ON READER SERVICE CARD

Samsung Ships 7-Pound SX Notebook

NEW

Samsung Information Systems America has joined the flood of 386SX notebooks with its 16-MHz NoteMaster 386S/16. The Taiwanese subsidiary is among the first to incorporate Chips & Technologies's new VGA chip set, which according to Samsung promises "near-photographic-quality VGA graphics." Measuring 2 by 11 by 8.5 inches (HWD) and weighing seven pounds, the NoteMaster 386S/16 features system memory expandable to 5MB, an internal high-density 3.5-inch floppy drive, a 3-hour nickel cadmium battery, 10-inch VGA LCD, 80-key AT-compatible keyboard, PS/2 mouse port, external VGA monitor port, and choice of either a 20- or 40MB Conner Peripherals 2.5-inch hard disk.

The NoteMaster—Samsung's first notebook—features quality VGA graphics.

The NoteMaster also implements an internal power management system that works in three modes: active/suspend/resume, Scalable Smart Sleep, or shutdown. The Scalable Smart Sleep mode allows the CPU to continue processing tasks that do not involve the keyboard before going into sleep mode. Traveling Software's *LapLink III* file-transfer software is included also.

List Price: NoteMaster 386S/16 with 1MB RAM, 20MB hard disk, $4,499. Samsung Information Systems America Inc., 3655 N. First St., San Jose, CA 95134; 800-446-0262 or 408-434-5400.

CIRCLE 449 ON READER SERVICE CARD

Clear Choice Thinking Provides Corporate Solutions

NEW

Daugbjerg & Associates, a firm which specializes in corporate problem solving, believes that the best solutions to problems, whether in the board room or on the shop floor, are all derived from the same logical, systematic analytical procedures. For this reason, the company has introduced an affordable decision-support software package designed to help managers organize, plan, define and solve problems, and make decisions. *Clear Choice Thinking* is a menu-driven package that operates in the Socratic method: It asks questions, and the user provides the answers.

A Concern Analysis module helps users define their needs, assign priorities, and make plans to meet them. Problem Analysis distinguishes between observed and related facts, analyzes them, tests for probable cause, verifies the cause, and suggests a remedy. When finished, users can print out a summary or save it to disk. Help screens are available at every stage of the process.

List Price: *Clear Choice Thinking*, $169. **Requires:** 512K, DOS 3.0 or later. Daugbjerg & Associates, 5 Post Oak Park, #2180, Houston, TX 77027; 713-622-7514.

CIRCLE 450 ON READER SERVICE CARD

A Guide for Selecting Accounting Software

NEW

In order to assist end users and consultants in selecting and installing an appropriate accounting system, **Solutions** has introduced *The Accounting Library*—a computer-based software analysis program. Featuring information on 70 different accounting packages, this program is designed to help you identify, analyze, select, and install the accounting package best suited to your needs.

The program allows the user to define and prioritize personal accounting requirements and compare these across the available list of packages. Although *The Accounting Library* itself is a single-user system operating on a DOS platform, the accounting products offered through it range from low-priced single-user systems to complex multiuser systems and function on a variety of operating platforms: DOS, Macintosh, LANs, and Unix. *The Accounting Library* also comes with a five-book reference set.

List Price: *The Accounting Library*, $479; Annual update subscription, $100. **Requires:** 640K, 2MB storage, DOS. Solutions, 587 S. Lake Blvd., Richmond, VA 23236; 804-794-3100.

CIRCLE 700 ON READER SERVICE CARD

IMPROVED

CONTINUED FROM PAGE 58

sensitive help, and customizable screen colors. In addition, standalone applications created from *Lotus 1-2-3* and other .WK1- and .WKS-compatible spreadsheets will now load and compile up to 40 percent faster. An enhanced graphing system offers precision axis scaling and improved font quality. While applications created with *Baler* 5.0 must be "rebaled" for 5.1, *BalerXE* compatibility is complete. Registered *Baler* 5.0 users can receive the upgrade for $45; the retail price is $495. Baler Software Corp. of Rolling Meadows, Ill., can be reached at 708-506-9700.

***ScriptView*, Version 2.01**—Reflecting *Paradox* 3.5's changes in the PAL language and tables, Farpoint Systems' application development tool *ScriptView* now provides analysis and documents scripts for Borland's updated RDBMS. The $149.95 program can be used to generate diagrams and reports, hierarchal tree flowcharts, procedure relationship reports, cross-references and tables, and queries. Contact Farpoint Systems Corp. in Jersey City, N.J. at 800-336-6644.

***AXS Accounting*, Version 2.0**—Computer Trends has added several new modules to its small-business accounting package, including inventory, job costing and time billing, as well as a payroll function. The checkbook module has been enhanced to include ratios, budgets, comparative statements, and cash-flow reports. In addition, the interface now includes universal search features and transparent data exchange between modules. Computer Trends is located in Ann Arbor, Mich., and can be reached at 800-544-2597.

Uncle Sam Says

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PC SOURCES, December 1990

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Washington Business Journal

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Net Worth Analysis PC Companies as of 12/31/89

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1	Iverson Computer	$20.914M	SEC	1979
2	Gateway 2000	$6.697M	D&B	1985
3	Zeos International	$2.200M	SEC	1987
4	Northgate	$.900M	D&B	1987

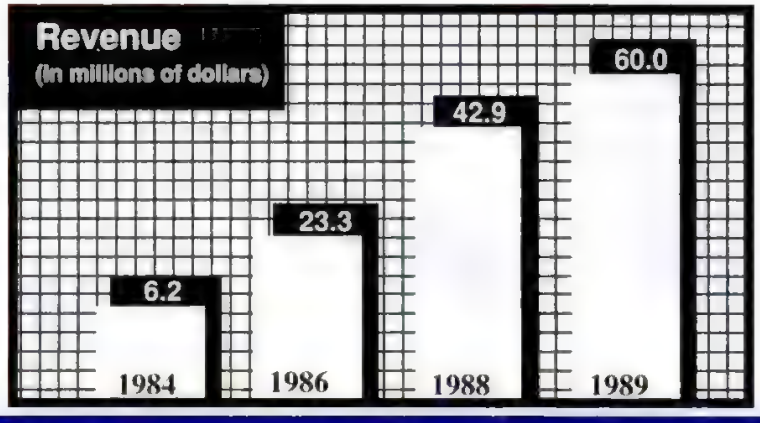
HIGH COMPANY RATINGS

Forbes Magazine, 1989

"Iverson... ranked #26 among the Best Small Companies in America."

Business Week, 1988

Rated Iverson as its 11th Top Growth Company of 1988



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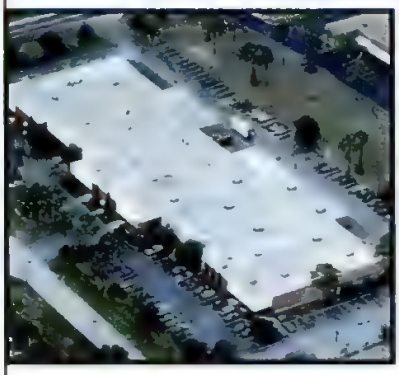

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Well, thanks to a CRT quality LCD screen with VGA resolution, the answer is crisp and clear.

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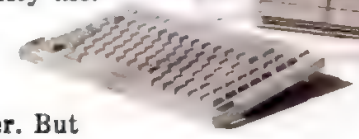

For product literature or location of your nearest dealer call 1-800-NEC-INFO.

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CIRCLE 217 ON READER SERVICE CARD

NEC

edited by Matthew J. Ross

Read Only

Reviews of the Latest Books for the PC User

Looking Forward ...

■ *The Art of Human-Computer Interface Design*
edited by Brenda Laurel
Addison-Wesley Publishing Co., $26.95

Great strides have been made in improving the human-computer interface since the days of toggle-switch front panels and punch cards. Yet even with the latest graphical interfaces, users still wish for a Do What I Mean interface.

Laurel's book takes a fascinating look at the future of computers.

Some people aren't joking about this possibility, however. They dream of computers that make their operation clear without complex instructions, like a simple hand tool that fits your grip in such a way that it suggests its own purpose.

Laurel's book consists of a collection of papers about this future vision. Since the project started at Apple Computer, it's no surprise that the book has a definite Macintosh flavor, but it does not place the Macintosh interface on a pedestal above all others.

Instead, many points of view and fascinating possibilities are represented. Meet Koko, the gorilla who was taught sign language, and now generates spoken language with a computer. Find out how Timothy Leary connects his current experiments with software interfaces to his mind-transforming past experiments with LSD, or learn about the virtual environment research that is being conducted at NASA's Ames Research Center.

One problem with Laurel's book is the lack of transition between papers, in spite of the logical sequencing of topics. The writing varies widely in tone and style, and the book is daunting simply because of its 500-page size. (If you are looking for a more accessible book on this topic, you might try *The Elements of Friendly Software Design*, by Fred Heckel.) However, it is wonderfully rich in information. The future described is so intriguing that you will not be able to leave any chapter unread.—**Alfred Poor**

Addison-Wesley Publishing Co., Reading, MA 01867; (617) 944-3700.
ISBN: 0-201-51797-3

CIRCLE 408 ON READER SERVICE CARD

With an Eye to The Past

■ *Staying with DOS*
by Dan Gookin
Ventana Press, $22.95

Gookin's book begins by discussing the merits of changing operating systems. So much so, that you're more apt to finish the first few chapters wondering if you should be ditching DOS rather than sticking with it. *Staying with DOS* needs to offer hands-on advice for choosing and using software to make DOS an operating system worth keeping. It does not. When Gookin starts to address some of the more common DOS problems, beginning in Chapter 6, the solutions are long on what to do, and short on just *how* to do them.

Pick any section. Use EMS to improve the environment? Fine, how do I do it? Install *DESQview* for multitasking? Fine, what configuration will provide optimal performance for my system? State that disk caching "will make your hard disk work a little better?" It begs a question—how do I make it work?

Mr. Gookin's chosen format of solution followed by Q&A, benefits, then drawbacks, sets the table nicely—it just doesn't serve up the meal.

To the book's credit, the decision trees included in the back pages of *Staying with DOS* are helpful. Similarly, there are many fine products mentioned both in the text and categorically listed with price and company information in the index, but the list is by no means comprehensive, with shareware and free utilities virtually ignored.

With so much attention paid to *Microsoft Windows* 3.0, why was so little paid to multitasking memory swaps like *DESQview*, utilities like *Norton* and *PC Tools*, and the like? But why should I expect dessert when I'm still waiting for the main course?—**Greg Pastrick**

Ventana Press, P.O. Box 2468, Chapel Hill, NC 27514; (919) 942-0220.
ISBN: 0-940087-48-0

CIRCLE 409 ON READER SERVICE CARD

■ *John C. Dvorak's PC Crash Course and Survival Guide*
by John C. Dvorak, with Peter Harrison and Stephen Frankel
Scandinavian PC Systems, $19.95.

Right up front, in bold print, the readers of this book are told that they'll learn "the least amount of detail you need to know" to run an IBM PC-compatible. It's a promise never broken. As *PC Magazine* columnist Dvorak writes in the foreword, *PC Crash Course and Survival Guide* is a flashback to the days when novice guides filled the magazine racks. If this book is bought in the hopes of gaining Dvorak-inspired advanced tips and techniques, well, as it says in the section on specifying a drive letter when using the DEL command, YOU HAVE BEEN WARNED.

Preceded by the basic tour of the PC inside and out, *PC Crash Course and Survival Guide* takes the reader through all the basic DOS commands with accompanying exercises in plain English. What's more, there's a primer on communications, buying equipment, and the all-important lesson on computer furniture.

For $15 more, *Dvorak's PC Crash Course* comes with a disk including equally simple practice routines. Based on the positive response to this primer by the beginners in my life, it's a guide worth giving the uninformed user.—**G.P.** ■

Scandinavian PC Systems Inc., Rockville, MD 20850; (301) 294-7450.
ISBN: 1-878322-05-2

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by Gus Venditto

Pipeline

A Look at the Trends Shaping the Personal Computer Market

After Years of Talk, a Broad Standard for Multimedia Is Finished At Last

Bill Gates has often talked about the system that would make every American family want to have a PC.

It would have VGA or better graphics; it would need a 80286 or better processor; it would sell for less than $2,000; it would have a compact disk player for reading large graphics files; and it would also have an audio processor.

Machines that meet the first three characteristics have been available for several years. PCs that meet the next two have been introduced, but there hasn't been any standardization.

That standardization will happen in 1991, thanks to an agreement between Microsoft and seven PC makers.

The spark that will make it happen is the unveiling of Microsoft's specification of a common multimedia API (applications program interface) and data formats. Microsoft is ready to ship the Multimedia Development Kit, enabling programmers to create applications to be used on the systems made by Tandy, AT&T, CompuAdd, Fujitsu, NEC, Olivetti, and Zenith.

And the programs should be compatible with upgrade kits that Headland, Media Vision, and Creative Labs will sell for existing PCs.

The data file formats, called RIFF, and an API for accessing devices, called MCI, will be application independent so the investment by software publishers will be transferable to other systems.

The standard uses the High Sierra storage format used by most CD players being sold for PCs. It also incorporates the popular MIDI standard for creating and playing music.

The first consumer products are expected to run under *Windows*, but IBM announced that it was licensing the technology for inclusion with OS/2.

MacroMind, which sold Microsoft code for use in the *Windows* extensions, announced a kit that converts the company's Mac multimedia software for use on a PC.

ISDN IN THE HOME? AT&T IS GIVING IT A TRIAL

The switch from an analog to a digital phone network was supposed to be beneficial to businesses, rather than homes. The cost of changing the switching equipment in thousands of small towns seemed to be an insurmountable obstacle to bringing ISDN (Integrated Services Digital Network) into the American home, and the range of services ISDN offered seemed to be valuable mostly to businesses.

Maybe not.

AT&T, finding limited interest in ISDN among businesses, has begun an ambitious experiment in 35 Rochester, New York, homes.

The homes will have incoming ISDN phone lines that plug into a device AT&T is calling a home network controller. It provides hookups that will work with the existing telephones in the homes.

Among the advantages will be several phone numbers on a single line, so different family members can have individual phone numbers. Each phone number can have a distinctive ring. Of course, simultaneous voice and data connections will be possible.

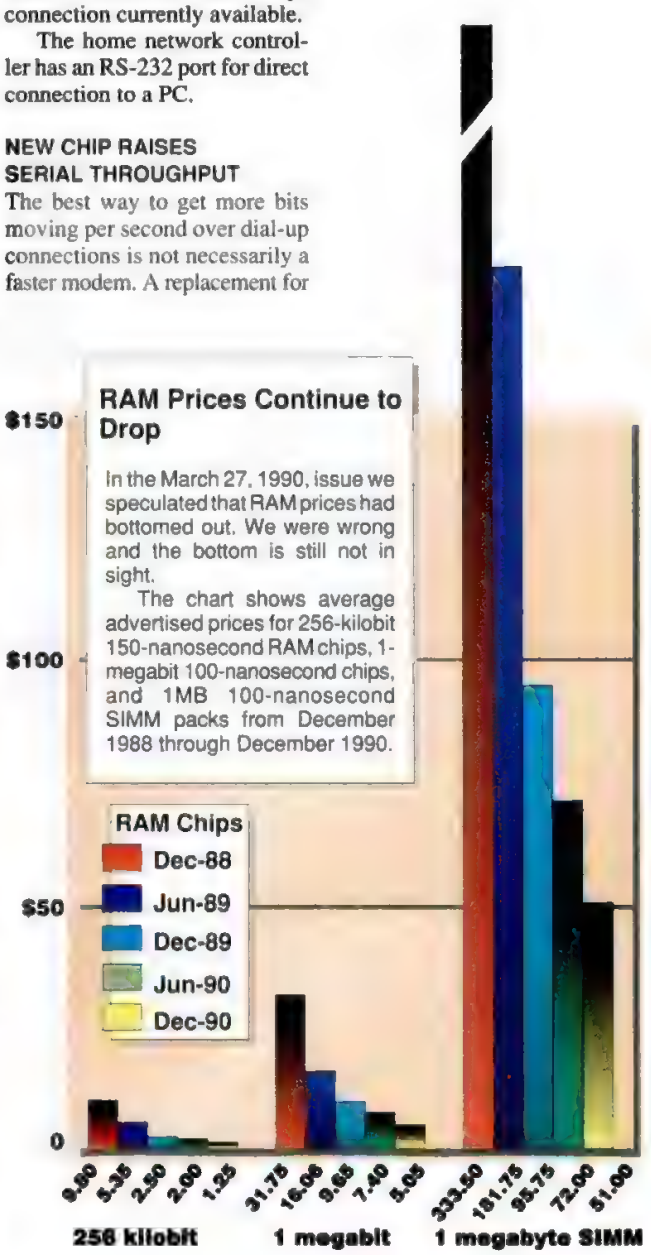
The trial will also test a special connection with Prodigy that will be faster than the 2,400-bps connection currently available.

The home network controller has an RS-232 port for direct connection to a PC.

NEW CHIP RAISES SERIAL THROUGHPUT

The best way to get more bits moving per second over dial-up connections is not necessarily a faster modem. A replacement for the chip that manages the interchange between your PC's processor and serial ports can give you a dramatic performance gain, especially when running multi-

CONTINUES ON PAGE 68



Pipeline

CONTINUED FROM PAGE 67

tasking software like *DESQview*, *Windows*, or OS/2.

The new chip is a UART (Universal Asynchronous Receiver Transmitter) that's pin-compatible with the UART already installed in most PCs built after 1985.

The 16450—a 16-bit UART—has been used in millions of ATs and 386s, serving well as a 16-bit buffer between incoming data and the processor. With multitasking software requiring greater synchronization between serial lines and the processor, however, the 16450 is starting to show its age.

The next generation UART, the 16550, looks like it will become a standard for helping faster PCs cope with fast modems. It has a 16-byte buffer to mediate the transfer of incoming serial data.

It emulates the 16450 in its default state, so it's compatible with current communications software. With programs that know how to access its larger buffer, however, the 16550 can dramatically increase throughput. *ProComm Plus*, *Telix*, *HyperAccess 5*, and *QMODEM* are already equipped to support the 16550's advanced mode, and you should see other programs add support soon.

Chip replacement is possible on a small number of machines where the 16450 is socketed; most machines have soldered-in UARTs.

Hayes uses the 16550 on its new board, the ESP Dual Enhanced Serial Port, where a dedicated communications coprocessor supplements the 16550.

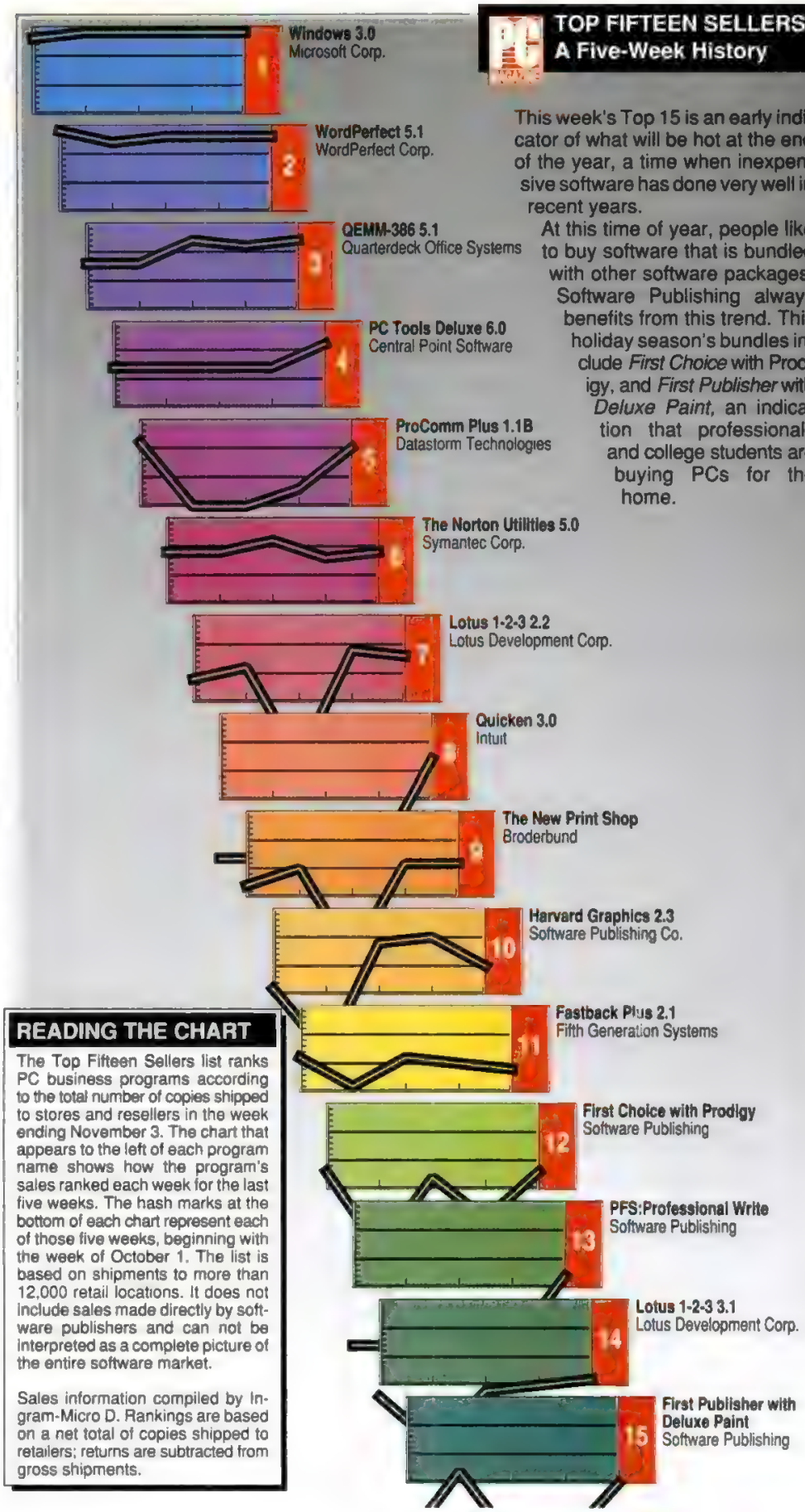
BUSINESSLAND SAYS NETWORKS ARE NO. 1

"Network systems are the future" is the way Businessland's chairman, David Norman, recently announced a shift at the retail chain.

After struggling through several unprofitable quarters, the chain has decided to dramatically increase its sales of net-

CONTINUES ON PAGE 71

TOP FIFTEEN SELLERS
A Five-Week History



This week's Top 15 is an early indicator of what will be hot at the end of the year, a time when inexpensive software has done very well in recent years.

At this time of year, people like to buy software that is bundled with other software packages; Software Publishing always benefits from this trend. This holiday season's bundles include *First Choice* with Prodigy, and *First Publisher* with *Deluxe Paint*, an indication that professionals and college students are buying PCs for the home.

READING THE CHART

The Top Fifteen Sellers list ranks PC business programs according to the total number of copies shipped to stores and resellers in the week ending November 3. The chart that appears to the left of each program name shows how the program's sales ranked each week for the last five weeks. The hash marks at the bottom of each chart represent each of those five weeks, beginning with the week of October 1. The list is based on shipments to more than 12,000 retail locations. It does not include sales made directly by software publishers and can not be interpreted as a complete picture of the entire software market.

Sales information compiled by Ingram-Micro D. Rankings are based on a net total of copies shipped to retailers; returns are subtracted from gross shipments.

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PC MAGAZINE EDITORS' CHOICE
June 13, 1989

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Pipeline

CONTINUED FROM PAGE 68

working products and services. Businessland forecasts that connectivity will represent 75 percent of the chain's revenue by the end of the decade.

SAMSUNG, CITING OVERSUPPLY, CUTS PRODUCTION OF 1-MEGABIT DRAM

In what may be an early warning that the RAM chip supply and demand curves are approaching turning points, Samsung announced that it was cutting its production of 1Mb DRAM chips.

As detailed in the chart on page 67, the price of all forms of RAM have been declining for over a year.

Samsung said it would produce eight million 1Mb chips in December, down from seven million in November. It cited a world oversupply and slumping demand as reasons for the reduction.

Businessland forecasts that connectivity will represent 75 percent of the chain's revenue by the end of the decade.

INTERNATIONAL NEWS: EXPANSION FOR COMPAQ, VICTORY FOR NOVELL

This past December, Compaq announced it was building a 76-acre distribution center in the Netherlands. Compaq will spend $57 million on the facility in Gornichem, which is expected to open in 1993.

Meanwhile, Novell succeeded in defending its copyright on *Advanced NetWare* in Spain. A Madrid judge barred a Spanish company from selling *CompNet*, which Novell said contained several programs that are essential to the operation of Novell's operating system.

The court ordered Computer Technology de Espana to stop selling *CompNet* and to turn over all existing copies of the software. It also started a review of the company's financial records in order to assess damages.

Novell's programmers determined that *CompNet* contained the basic *NetWare* kernel, security schemes, cache algorithms, and some user utilities.

Novell was first alerted to the problem in 1988 by Keylan S.A., a Barcelona company that was licensed to distribute Novell products. ■

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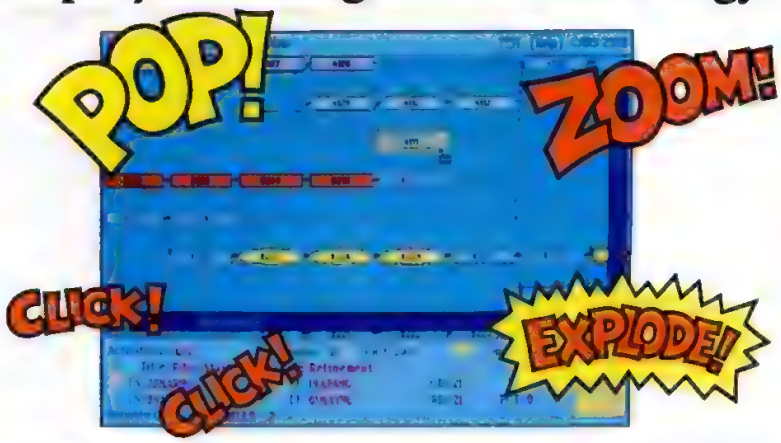

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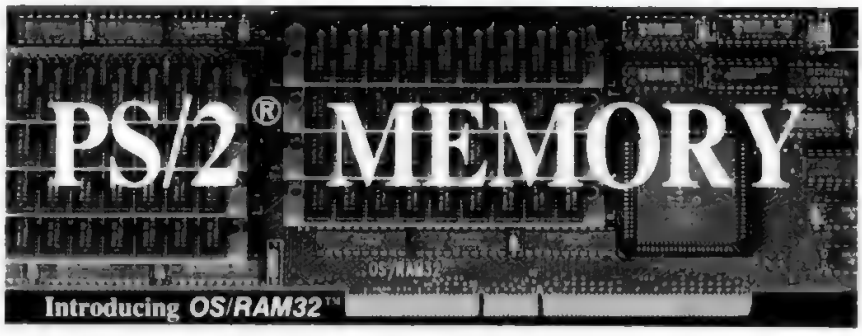

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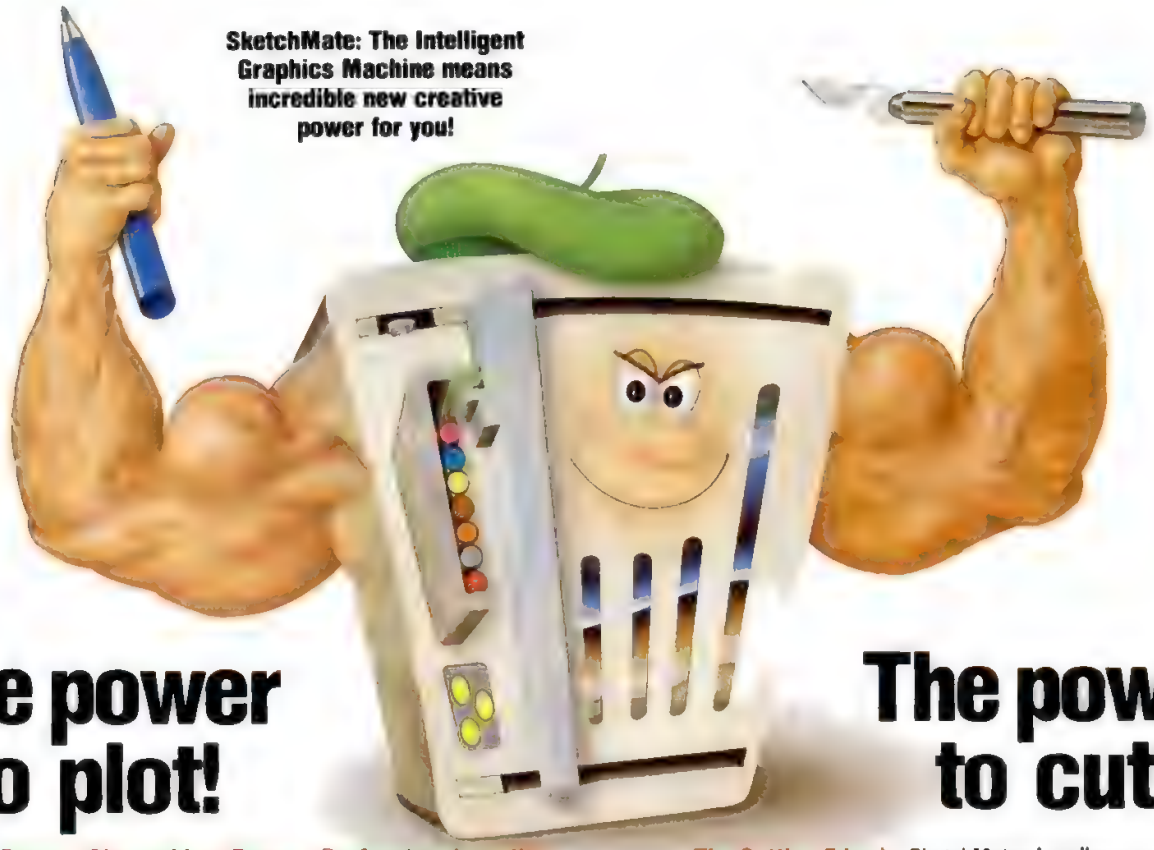

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Half a dozen vendors, including Radio Shack, Sears, and Stanley market X-10 modules. These controlling devices transmit messages using standard in-the-wall electrical wiring to turn lights or appliances on or off. Some of the controllers and modules permit you to dim lights, as well. Potential applications are limited only by your imagination.

Perhaps you'd like a chime to ring or a light to flash if someone opens a stockroom door. Rather than having an alarm company do a custom installation, you can use a pair of X-10 modules wherever there are wall outlets.

Businesses need to conserve electricity, too. The usual practice has the first person to arrive in the morning turn everything on, and the last person out at night turn everything off. The expense and waste are obvious. Timer control units have been available for years, to give your home or business that lived-in look even when you're away. X-10 wall switch replacement modules and central timer controls make this task easier. One of their big advantages over individual mechanical timers is that you don't have to reach behind the furniture to turn on a lamp at other than its programmed time.

The big drawback in this automation always has been programming the timer. Simple things like the change of the seasons or switching to Daylight Savings Time are major inconveniences, hardly better than running around and resetting individual timers. Another complaint has been that X-10 modules are unreliable outside the home because of the higher electrical noise from business machinery.

There's a solution to the reliability objection, but it's a well-kept secret. For years, Leviton has made industrial-grade X-10 components and sold them through industrial electrical suppliers. However, Leviton recently sold its operation to ACT Corp., which has caused some distributors to think that the modules are no longer available. They are.

The industrial units are more rugged and far less prone to false triggering than commercial X-10 counterparts. ACT also has components you won't find in Radio Shack or the security stores. For instance, a wall switch-sized transmitter lets you install different keypads, with two or four on/off switches or dimmers, so you can control up to four fixtures or appliances from one switch. An ACT receiver module hides inside built-in fixtures or ceiling fans, turning them into remote-control devices.

PUTTING YOUR PC TO WORK

So where does the PC fit into all of this? Flexible control. I've seen X-10 units that plugged into an expansion slot on your PC, but they required that you leave the machine on. The new generation of controller technology allows you to write the timing program on your PC, then download it via a serial port to the controller. You can spend as little as $69 or up to $400. The low-end version, the PowerHouse Computer Interface, is pretty much like the

ILLUSTRATION: JUD GUITTEAU

standard timer controllers, except you program it from the PC. Believe me, it's much easier to key in numbers directly when you're setting a time, rather than to hold the Fast and Slow buttons down. The hours and minutes go reeling by with the chance of overshooting your target setting. Unlike the ordinary controller, the PC interface also lets you program in brightness levels, so that you can conserve power or set different moods in the course of the day.

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CIRCLE 727 ON READER SERVICE CARD

Bill Machrone

The high end, represented by Enerlogic's amazing System 1400, will challenge your imagination. Far more than a controller that sends on/off and dimming commands at specified times, the System 1400 "listens" for X-10 commands, checks its program for instructions, and transmits the appropriate commands. You program your transmitters to talk directly to the System 1400, not the light or appliance. It also comes with a powerful if-then-else language that you compile on the PC and download into the controller. So you can write a sequence such as

```
IF (Door_Open AND After_Hours)
 Warninglight ON
 Alarmbell ON
ENDIF
```

The System 1400 even lets you simulate the sequences before you download them. What could be easier? The syntax is realistic; you define all your transmitters and devices at the outset, then use those names instead of cryptic codes. Combine the System 1400 with a unit such as the Stanley Smart Light, or the Reflex Sundowner Controller, and you've solved the age-old problem of telling an X-10 system when it's dark out. Another handy module is the Soundlighter, which hears noises in a room. You can install one wherever there's a light switch. It can control a light directly, or in conjunction with a PC to send signals to the System 1400.

One of the biggest challenges to the home/business automator has been to find the components. Radio Shack and Sears have only the most basic controllers, lamp modules, and switches. You can find more in the Heath/Zenith catalog, including some neat remote-control X-10 devices. The security stores found in many malls typically carry the Stanley line. But the hands-down winner for sheer variety and product information is Home Automation Laboratories, a direct marketing firm in Atlanta, Georgia. Their catalog offers over 40 pages of products, including remote-control, industrial and consumer X-10, computer-control, security, and communications products, including a slow-scan TV camera that works with a modem over regular phone lines.

Look into these technologies and how they can help you around your home and office. It should be an illuminating experience. ■

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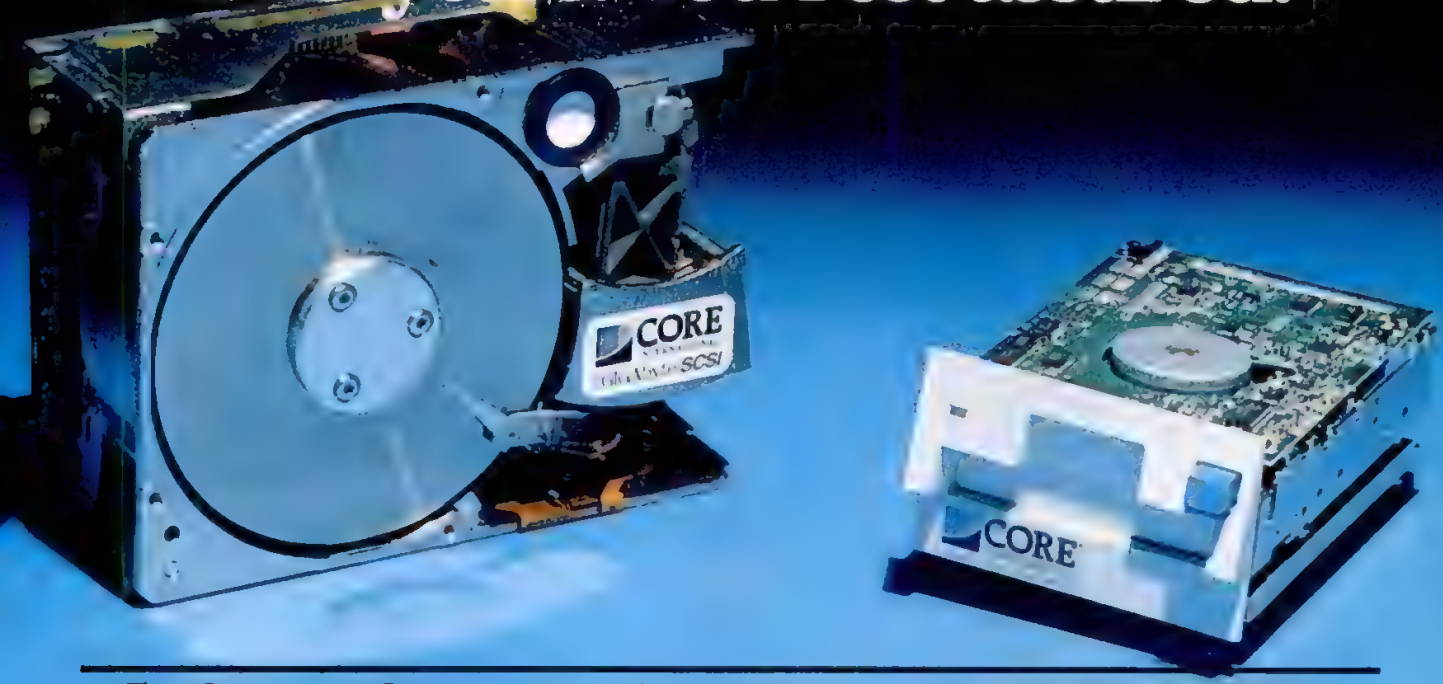

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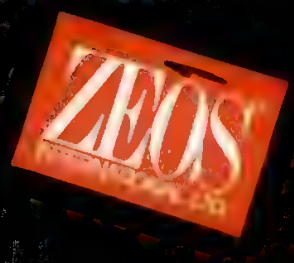

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John C. Dvorak

Windows, The Mac, And DOS

The efficiency and power of batch files and the command line interface will prevent users from falling into a graphical mousetrap.

Remarkably, *Windows* has attracted substantial numbers of die-hard Mac aficionados into the PC camp. In the past this has been nearly impossible as the tendency was for PC users to toy with the Mac then gravitate in that direction. The opposite was never true.

As someone who believes in multitasking with multicomputers, it's hard to accept the notion of using only one machine. No users who have the resources to use multiple machines choose to use just one machine after the experience. Many people have gone so far as to network machines throughout their house and multitask by accessing the remote systems while the core machine does something else. It's like juggling.

Anyway, I'm lucky enough to use a Mac IIfx and a 486. I do most of the raw work on the 486. I'm one of those writers who works with my feet up on the desk and the keyboard resting on my thighs as I lean back in a swivel chair. It's amazingly comfortable, and I think prevents carpal-tunnel syndrome, but it simply cannot be done with a mouse-oriented Mac. With *Windows* and its keyboard substitute commands, it's more do-able to get in this position, *but* if you don't use a mouse, then what is the point of the *Windows* GUI?

This is one reason why I think *Windows* will reach only a small segment of the PC world, maybe a third of all users. I recently re-explored *Windows* and realized that it's incredibly inefficient when compared to the command line approach to computing. There are a number of problems that I encounter on the GUI Mac. On a PC running *Windows*, it is even worse.

First, with a command line you can work ahead. You can type a series of commands while the first executes. There is no way to "mouse" ahead. In fact, in a classic GUI, because of the need to click on icons, the efficiency of batch files is lost. How do you batch a series of commands when you're required to point and shoot to execute?

Even if you could control mouse functionality by some cursor movement "recorder," you still have a problem if icons are dragged to different screen locations or files are changed. With a command line interface, the program is executed by name, not by screen location.

These considerations are immediately ignored by command line trained users until they discover that classes of activities can no longer be done. For example, it is much more difficult to delete classes of files in an icon-based GUI system. With a command line I simply type "ERASE *.BAK" to get rid of the pesky backup files, for example. This is a much more complicated procedure with a GUI. If you know what you're doing, it's hard to beat the efficiency of a command line interface. Why play graphics games with a computer when you can simply *tell* it what to do?

There are situations where the GUI saves time. Nothing on the PC matches the word processors found on the Macintosh. They are powerful, loaded with features, and GUI-oriented, which pays off when you are doing complex output and working with WYSIWYG on-screen. I suppose that if I didn't do everything electronically, using MCI Mail and telecommunications to file articles, and had to print out everything, then I'd use a Mac all the time. But I don't. In fact, the future is trending toward less and less paper communication and more toward electronic communication.

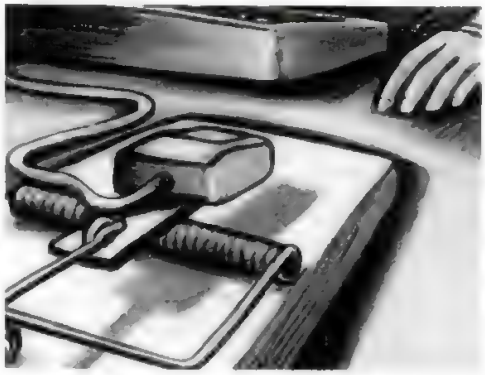

ILLUSTRATION: JUD GUITTEAU

So what's the point of *Windows*? To do some simple multitasking, perhaps done better with *DESQview?* Or is it just to steal some business away from Apple and give some complainers a cheap Mac kind of machine? Maybe it's just an attempt to prove that a GUI can be done on a PC. I can't tell, but I know that it's going to be hard for *Windows* to get my feet off the desk.

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John C.
Dvorak

Inside Track

A recent issue of *IEEE Spectrum* focused on the research and development efforts by the major corporations of the world. A glance at the list of the top companies' **R&D expenditures** as a percentage of sales was revealing. At the **top of the list** were defense contractors Northrop, Lockheed, and TRW. Right beneath them were two **semiconductor companies,** Advanced Micro Devices and Harris. Sounds like a **pumping up** effort to **clone the 386** chip to me. (It's still up in the air whether AMD will call its new chip a "386" since Intel and AMD are now **squabbling in court** over usage of the numbers "386." Personally I don't think the moniker is that important. I sure don't care that much that my NEC UltraLite runs a V-20 and not an 8088.)

Back to R&D numbers. In case you're interested in terms of **sheer dollars** spent on R&D, **IBM is way out in front** worldwide with **over $5.9 billion** in expenditures, followed by Lockheed with $3.9 billion, Siemens at $3.7 billion, and GE with 3.6 billion.

The U.S. still **outpaces the frenetic Japanese** for patents with 9,000 per annum versus 6,000 for the Japanese. Much of the Japanese effort, though, goes into engineering and much of ours seems to be going into life sciences.

A Major Trend in the Making Dept.: As anyone traveling to Asia already knows, there is a **booming new market** in machines that have a **peculiar new slot** in the front of the machine—one that accepts the newly **standardized memory** card. A new Acer machine heavily advertised in Asia is a perfect example. The new card is designed to replace the numerous nonstandard plug-in memory cards used for diskless laptops. It might also become an **important software distribution** medium.

A new memory card format may become an important medium for distributing software to protect against bootlegging.

It's possible to **protect software from piracy** if sold and distributed on this media. Right now in the software world a preoccupation with piracy and **bootlegging** is the number one issue. The European software directive and frenetic hand-wringing by the Software Publishers Association and other groups are making this **the issue of the 1990s.** There is some justification for this since the **international community,** which has mediocre software distribution channels, finds it **easier to pirate** software than to find a place to buy it.

The worse spots for this are the **Soviet Union** and other older socialist states where software, by its nature as an intellectual property, is considered as "owned" by the people and thus free for the asking. It's believed that unless software is **turned into hardware** (with these memory cards as the vehicle) that bootlegging will run rampant everywhere except in the U.S., where **public opinion** condemns copy protection and does a decent job of self-policing the pirates. Even still, you can expect these cards to become a prevalent distribution method in the U.S. for highly specialized and expensive software. Expect to see some vendors **giving the add-in board** (which can read the memory cards) **away free.**

My opinion? Anything is better than the minitrend toward those **idiotic "keys"** that attach to the parallel or serial port.

Operating Systems Dept.: While Microsoft seems to have the go-ahead to develop its **portable OS/2,** IBM may be working on an new operating system with its strategic partner Metaphor. There has been much chitchat about **a falling-out** between IBM and Microsoft with denials all around, and more and more evidence indicates fact that the two are going in **opposite directions.**

Meanwhile Digital Equipment Corp. seems to be readying a portable VMS as DEC is making public announcements about an "open" VMS and RISC. VMS and DOS have **identical roots** as operating systems, and VMS, if ported onto a popular desktop environment, may find immediate acceptance. There is still **magic left in the old "C:\>" prompt.** OS/2 has these same roots, but seems to have some black magic curse hanging over it.

On-Line Dept.: Looking for a good directory of on-line databases? The **voluminous** quarterly Directory of Online Databases, published by Cuadra/Elsevier, is what I use. It's $175 for two complete issues and two supplements. Order directly from Elsevier Science Publishing Co. Inc., 655 Avenue of the Americas, New York, NY 10010; (212) 633-3980; fax (212) 633-3990. **Very handy.**

The number of databases is steadily growing. According to Elsevier, there were 400 major databases, 59 on-line services, and 221 database producers in 1979. Today there are **over 4,615 databases,** 654 on-line services, and 2,005 producers.

But does it Really Do Anything Dept.: I've been playing with a new patented software package called Vision Aerobics, one of the **strangest products** I've seen for some time. It comes from Vision Aerobics Inc., 10 Mechanics St., #G, Red Bank, NJ 07701; (201) 219-1916; fax (201) 219-9697. According to the vendor, this $129 package can be used to build up the eye muscles and **reduce eye fatigue,** something common to computer users. I ran through these exercises using the special glasses provided in the package and **felt like blinking** a lot when I was done. This notion of "eye exercises" has been **in and out of vogue** for decades. This is the first computer implementation of such a program. ■

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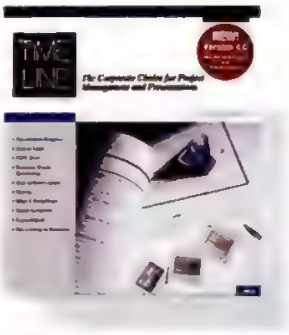

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CIRCLE 344 ON READER SERVICE CARD

Jim Seymour

Beyond Code: The PC-Data Business

Data-in-a-box is what users need for the second PC decade.

For the first decade of the PC business, the pattern was pretty simple. We bought PCs, then we bought software packages consisting of code which, when executed, allowed us to plug in our own information and manipulate it. We tapped numbers, words, records and drawings into spreadsheet programs, word processing programs, database programs, and graphics programs.

PCs became power tools for leveraging our own ideas—a powerful and far-reaching metaphor for change in business, and for many of us, in our personal lives as well.

I'm convinced that the second decade of PCs will be characterized by a broader role, as we add a third dimension: We're going to be buying a lot of data, as well as program code, on those ubiquitous disks. It's great to have tools as powerful and flexible as today's PC applications-software packages to help us organize, polish, and present our thoughts to others. But just as network-based workgroup computing is helping us reach beyond our own desks and ideas, to incorporate the work of others, we're finding more and more the need to reach beyond our own *ideas*, to draw into our work data acquired from the larger world.

And so I think we're going to start buying data in a big way.

Some will argue that this is nothing new: People have been downloading data from on-line services for a long time. Dow Jones News/Retrieval, CompuServe, Dialog, and many other electronic pathways to enormous libraries of on-line data offer an invaluable resource. True . . . as far as that goes.

But despite a decade of frantic marketing, those on-line services are still used by only a tiny slice of PC users.

PRIVATE DATA

I'm convinced people want data they "own," by which I mean data they have instantly and physically accessible, at their desks. Even if for pricing reasons they can only get at a part of the data on that CD-ROM or in that stack of floppies, they want *local* data, not dial-up data.

Examples of success in selling data to PC users? When Dick Brass started General Information years ago, he already understood the value of information to PC users. He'd tied up the electronic rights to a good dictionary years before, and produced the first big-selling PC spell-checkers. At General Information, he introduced *Hot Line* (now *Hot Line 2*), a superb $99 auto-dialer and phone-list manager.

But this was really a razors-and-blades strategy: In addition to the modest-sized directory of businesses which came with *Hot Line* (and, of course, its ability to store and dial your own personal lists), General Information offered a long list of other, much larger, more-specialized directories: tens of thousands of names, addresses, and phone numbers for travel, media, high-tech, financial, and other industries. You could add any or all of 'em, once you'd bought that first inexpensive *Hot Line* package.

As Brass and his successor, Joel Horn, well understood, the real value was in the data they had for sale; *Hot Line* was nothing more than a means of accessing that data.

ILLUSTRATION: JUD GUITTEAU

Now General Information is pushing the entry price down further, with a sensational new value: The current version of *Hot Line 2*, plus a 16MB file of 116,000-plus 800 numbers, costs just $59.

Horn is working with regional phone companies to offer other customized packages, such as a USWest bundle of *Hot Line 2* with an 85,000-name list of Seattle-area businesses.

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CIRCLE 250 ON READER SERVICE CARD

Jim Seymour

Another example? Look at what Lotus is doing with *MarketPlace*, one of the most interesting new products of 1989. Now available only on the Mac, but undoubtedly coming to the PC soon, this one even led to a new buzz-phrase: *desktop marketing*.

MarketPlace: Business is a CD-ROM with seven million listings of U.S. businesses, including contact names. A Lotus-provided search program extracts data according to your specs. You can apply at your desktop the high-powered search-and-select tools of marketers who have had to use information on this scale on mainframes. For $695 you get the disk, the search software, and access to any 5,000 entries. You can unlock additional entries in 5,000-name blocks for $400 per. And to make certain that the data you're using is current, you can get a one-year subscription, with 90-day updates, for another $150.

MarketPlace: Households, coming soon, offers a list of 120 million consumers in 80 million U.S. households.

Putting this kind of massive database on your desk isn't new at Lotus; since 1986 it has provided CD-ROM titles in its *One Source* series covering securities data, mergers-and-acquisitions details, bank information, and other records.

Some efforts to deliver information reach beyond the PC itself. Microlytics, for example, which had hits with its *GOfer* and *Word Finder* packages for PCs, is now focusing on dedicated hand-held units. In addition to the New Testament in a calculator-sized package, Microlytics also offers the *Physician's Desk Reference* in a wallet-sized device.

THE CHANGING FACE OF SOFTWARE

This avalanche of data products for PCs is going to continue. CD-ROM is an obvious distribution medium for very large databases, up to 500MB or so.

But by compressing data with *PKZIP* or another archiving program, vendors can pack a lot onto ordinary floppies, too. General Information, for example, squeezes that 16MB file of 800-numbers onto eight 360K disks.

During the 1980s software meant for *applications*. In the '90s we'll focus more and more on software as sources of data to use with applications we already own. ■

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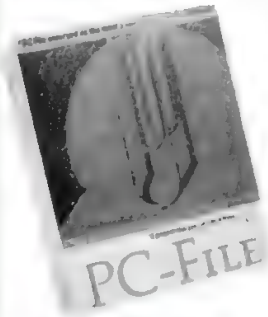

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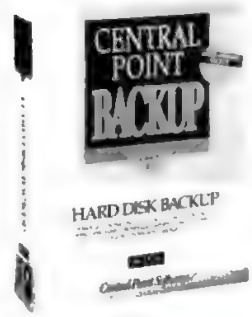

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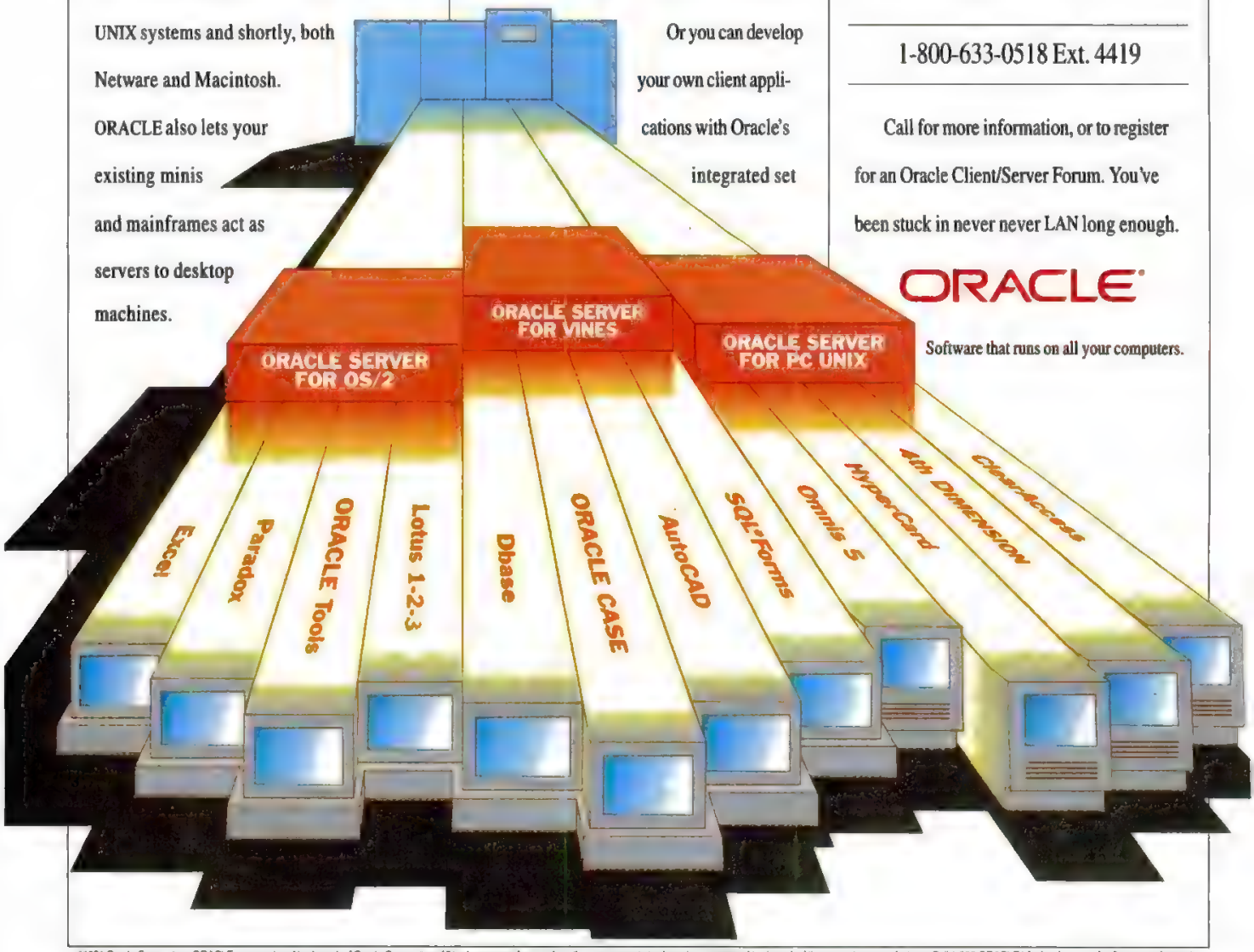

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William F.
Zachmann

Microsoft Vs. IBM

A look inside the power struggles between Microsoft and IBM over OS/2.

IBM and Microsoft's partnership over OS/2 has always been characterized by differing interests and priorities as well as by shared objectives. Tensions between the two are dynamic, changing under the impact of external market forces.

IBM's initial, hidden agenda was to derive renewed proprietary advantage from OS/2 via the OS/2 Extended Edition and its linkage to the PS/2 and Micro Channel architecture. Microsoft, as a software company, wanted to create a de facto operating system standard widely supported by many system vendors.

IBM chose initially to ignore *Windows*, aiming for a direct migration from DOS to OS/2. OS/2 for IBM meant its OS/2 Extended Edition running on IBM PS/2s with IBM's Micro Channel. Slow acceptance of OS/2 derailed that strategy. This slow adoption of OS/2 had several causes.

First, OS/2 simply wasn't in a form acceptable to a wide range of users. By the end of 1989, two and a half years after its introduction, OS/2 still lacked elements critical to wide acceptance. At the end of 1989, IBM's Version 1.2 still lacked drivers for many of the most popular printers, displays, network adapters, and other key peripherals.

Second, DOS compatibility in all the 1.*x* versions of OS/2 was inadequate. Difficulties in supporting even a single DOS application gave the OS/2 "DOS box" the nickname "penalty box" and a reputation for unreliability that later improvements could not shake.

Third, OS/2 needed more resources than originally intended (and claimed). Although developed around the limitations of the Intel 286, OS/2 really needed faster processing than an 80286 processor provided. Memory and disk requirements exceeded early estimates (and promises) as well.

Finally, IBM's promotion of OS/2 and the PS/2 as a "matched pair" created a widespread (and inaccurate) impression that OS/2 was somehow exclusive to IBM and would not be supported by other system vendors.

A key difference between IBM and Microsoft was in the expected payoff from their investments in OS/2. IBM, fundamentally a hardware company, saw its payoff from OS/2 to be primarily in more hardware sales. For Microsoft, the payoff was directly through software sales.

By the last half of 1989 there was little doubt that OS/2 was not selling well. IBM and Microsoft were affected differently by that and had very different ideas of what to do about it.

DIFFERENT STRATEGIES

IBM's response was to accelerate the release of new OS/2 versions, even if that meant releasing code that could benefit from further development and testing (as with IBM's Version 1.2); to try to reduce the resource requirements for OS/2 (as with IBM Version 1.3); and to defer additional improvements to future releases of the operating system.

Microsoft argued instead that it was better to delay future releases until they were done right; to forget about running on 286s and concentrate on more capable 386 and 486 systems; and to add better features (improved file and program managers, for example), expanded device support, easier installation,

ILLUSTRATION: JUD GUITTEAU

and other usability improvements before launching a renewed push for OS/2.

IBM's and Microsoft's different priorities were partly the cause for their different diagnoses of what was wrong with OS/2 and how to fix it. But the most important difference concerned *Windows*. IBM, still looking for proprietary advantage from OS/2, did not consider *Windows* an option. Microsoft did.

To enhance *Windows* as a stopgap measure

in response to slow OS/2 acceptance appealed to Microsoft because it could produce the revenues that OS/2 didn't. Equally important, *Windows* gave Microsoft an opportunity to prove that its interpretation—rather than IBM's—of what was wrong with OS/2 was correct.

These differences over the slow acceptance of OS/2 led to growing friction between IBM and Microsoft by late 1989. The IBM/Microsoft joint statement at Fall Comdex '89 was a last-minute effort to paper over these differences, but it wasn't backed by a substantial agreement between the two.

Relations between IBM and Microsoft continued to deteriorate early in 1990. Daily coordination of OS/2 code development ceased. Microsoft's launch of *Windows* 3.0 at first exacerbated matters. To those who knew what was really going on, it looked like the two were headed for a major split.

The success of *Win* 3 showed that Microsoft's view of what was required for the success of OS/2 was correct: Microsoft did to *Windows* 3.0 precisely what it had argued should be done for OS/2.

Windows 3.0's success also showed that if the relation between IBM and Microsoft did come to an end, Microsoft could, if necessary, develop *Windows* into a rival to OS/2. Microsoft could add incrementally to *Windows* many of the capabilities OS/2 had but that *Windows* lacked. It gave IBM more reason to accept *Windows* as a transition environment and to agree to a reconciliation on terms acceptable to Microsoft.

As a result, IBM and Microsoft did not go their separate ways but concluded a greatly expanded set of new agreements. While these did not eliminate all differences between the two, they did reduce them significantly and kept the partnership intact.

By granting IBM rights to *Windows* and expanded rights to DOS (including future versions), and by granting Microsoft rights to IBM's developed versions of OS/2 (including Version 1.3 and further work on 2.0), the new agreements expanded the areas of common interest. They also amount to an IBM endorsement of Microsoft's view of *Windows* (as a step on the road to OS/2) as well as a recommitment, by Microsoft, to OS/2 as the ultimate goal.

The agreements also marked a virtual abandonment, by IBM, of the 1987 effort to gain proprietary advantage from OS/2. That was shown, too, by IBM's renewed commitment to make OS/2 Extended Edition capabilities available for non-IBM systems. IBM's more open position regarding MCA licensing, including future versions, is further evidence of that.

As a result, users are now free to use *Windows* and OS/2 in any combination, confident that both IBM and Microsoft are committed to long-term support of their choices. That is not only good for users, but good for *Windows* and OS/2, as well.

Questions, of course, remain as to what all this means, both for the relative acceptance of *Windows* and OS/2 in the months and years ahead and for their future development. Those are questions that I will address in my next column. ■

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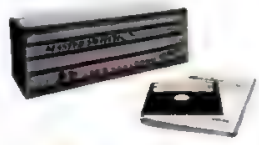

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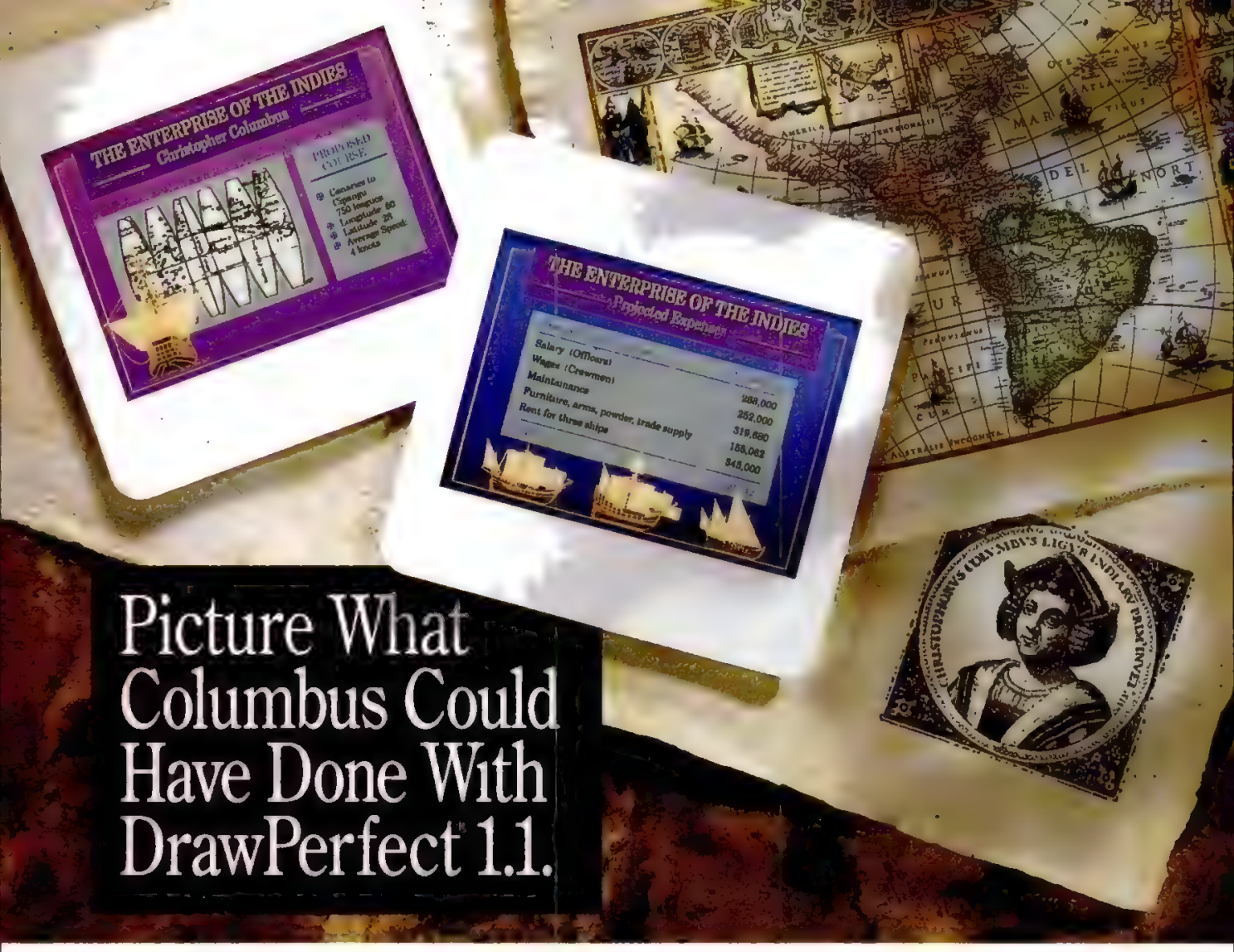

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PHOTOCOPIES PERMITTED

25-MHz 386 PCs

Solid Investments for the Desktop

by Bruce Brown

The price of true 80386 computing continues to go down even as performance improves. Fully configured 25-MHz 80386DX-based systems—with hard disk capacities of 150MB or better and VGA color displays—can now be had for under $3,000; they are typically available for about $3,500 to $4,500. The IDE hard disk technology and fast high-resolution video chip sets often found on these machines give you speedy data access and good screen response.

25-MHz 386s remain a fine choice for many corporate environments, and as more systems incorporate small-footprint designs and FCC Class B certification, they are also becoming excellent choices for extending the workday at home.

PHOTOGRAPHY: THOM O'CONNOR

25-MHz 386 PCs

In their infancy, 25-MHz 386-based machines were the fastest things without legs. At the time, they were touted as ideal network file servers and as the ultimate systems for applications like computer-aided drafting and design, where the best results are obtained by using the very fastest processor available. That role was later usurped, first by the 386/33 and most recently by a host of 486-based systems. As the 386/33 has become the top-end desktop workhorse machine, the 25-MHz 386 stands in a good position to fill two roles.

For one thing, the 386/25 can serve as a corporate user's entry-level splurge into the world of both 32-bit memory and 32-bit data paths. And since most 25-MHz 386s offer FCC Class B certification in a world where many 33-MHz 386s and 486s still lack it (chiefly because emissions from their faster CPUs are harder to shield), these machines can let you extend your business day into the evening hours in the comfort of your own home. They provide the muscle you need to perform all but the most heavy-duty tasks.

Most 25-MHz 386s offer FCC Class B certification in a world where many 33-MHz 386s and 486s still lack it.

PRICE AND PERFORMANCE ISSUES

In *PC Magazine*'s standard configuration—4MB of RAM, RAM cache when available, a 150MB hard disk, VGA or Super VGA color display systems, and DOS—these 25-MHz 386s range in price from $2,620 to $8,865. The higher-priced systems are typically offered by major manufacturers who sell through dealers. But since the dealers often offer discounts of 25 to 35 percent off the list price, even the most expensive systems covered here should sell for under $6,000.

The average list price of the standard-configuration 25-MHz systems is about $4,800. That doesn't seem like a tremendous bargain when you consider that the average list price of similarly configured 386/33s, with RAM caches as part of their standard equipment, is around $5,200. (Averages aside, it is worth noting that in our last two reviews of 33-MHz 386 machines, where we saw a total of 71 systems, only one was priced below $3,000. In this roundup of only 14 25-MHz machines, three systems came in under that amount.)

The additional $400 would buy you a processor that runs about 33 percent faster than the 25-MHz 80386 chip; the speed

EDITORS' CHOICE

• **Dell System 325D**

The Dell System 325D stands alone in its category, thanks to its top-notch integrated design, great service, and a return to the reasonable pricing that made Dell a player in the first place. With its small-footprint case, the Dell machine leaves plenty of room for growth by incorporating video and all system memory onto the motherboard, thus saving slots.

To guide you through the system, the company provides a clear illustration of all its components, right on the chassis. Dell further emphasizes its concern for the user by offering on-site service from Xerox, toll-free technical support, and a 30-day money-back guarantee. And since this machine consistently outscores the others on our benchmark tests, it is well worth the $4,318 you would pay for a unit configured with 4MB of RAM, 32K of processor RAM cache, a 200MB hard disk, one 1.2MB floppy disk drive, a Super VGA color display subsystem, and DOS 4.01. (This system came closest to the standard configuration *PC Magazine* requested, though we specified only a 150MB hard disk and VGA subsystem.)

Two computers receive honorable mention: Hewlett-Packard's HP Vectra 386/25, for its exceptional expandability, and the Compaq Deskpro 386/25e for its rock-solid construction and superior video.

The HP Vectra 386/25 is high-priced but offers expandability up to 32MB on the motherboard; the company consistently sells solid PCs. The list price is $7,248, but dealer discounts could bring the system down to below $5,000.

The Deskpro 386/25e is noteworthy for construction that's as solid as any of Compaq's other systems. In response to market forces, Compaq lowered its prices 20 to 25 percent across the board in late 1990, and the $6,999 list price for our standard configuration reflects that reduction. Support and service remain dealer-dependent, but you'll get the assurance of Compaq quality if you spend the money for this system.

Finally, you might also want to consider the computers from Austin, Blackship, and National Micro Systems. Austin offers good service and support for its 386/25 Winstation, though its expandability is limited to 8MB. The company adds value to its $3,788 price tag, however, by loading its system with *Microsoft Windows* 3.0 and a Microsoft mouse. Austin also offers a toll-free phone number, overnight delivery of components, and GE on-site service, to give mail-order computer buyers the kind of support and service they need.

The Blackship 386/25 comes with good performance and a middle-of-the-road price. The company has concentrated on improving its service and support policies by adding GE on-site service, toll-free technical support, and a money-back guarantee to its package. For $3,865, this is a system to consider.

The Flash 386 series has delivered good performance and thoughtful design, promising good value as low-priced alternatives. National Micro Systems still lacks on-site service, and its documentation is less than ideal. But the Flash 386-25 has a clean internal layout, it consistently scored among the top third of the machines we tested, and it bears a low list price of $2,799.

difference is most clearly reflected in PC Magazine Labs' processor and memory benchmark test results. In real-world applications, that difference will have an impact on every action the computer takes that depends on CPU response or processing time, such as making calculations, processing data for reading and writing, and sorting data.

Still, many users don't need the extra speed bump, even at a minimal cost of a few hundred dollars. (And in corporations where a budget must be stretched to cover lots of PCs, those dollars can really add up.) If you use your PC mostly for word processing, small spreadsheets or databases, or other text-mode operations, where the biggest factor in determining how fast work gets done is your own typing speed, then there's no urgent need to jump to 33-MHz equipment. It's only when you work with huge spreadsheets or databases, use other CPU-intensive applications, or operate under a graphical environment like *Microsoft Windows* 3.0 that you'll want the fastest processor (and other tools) you can squeeze out of the budget.

FCC CLASS B AND YOU

In this issue, we look at 14 25-MHz 386 ISA-bus computers from Austin, Blackship, Compaq, Computer Market Place, Dell, DTK, GCH Systems, Hewlett-Packard, National Micro Systems, NEC, Olivetti, Thoroughbred, Twinhead, and USA Flex. All have small-footprint cases and the desirable FCC Class B rating—both particularly important factors for home users.

Of course, the Class B rating is a legal must-have for the homebound PC, but it's also valuable for systems that will see service only in office situations. This rating means that the system is less likely to send out unwanted emissions that might interfere with other electronic devices around the workplace. A machine with the Class B rating is better protected from incoming electrical interference as well, which is especially significant in offices housing lots of computers and other electronic equipment.

REVIEW CRITERIA

Besides requiring a Class B rating, we specified a standard configuration including 4MB of RAM, a 150MB hard disk (or the closest available equivalent, within a range of 130MB to 200MB), a noncaching hard disk controller, one high-density floppy disk drive (unless the system normally comes with two), an ISA bus, a VGA or Super VGA display, one parallel and two serial ports, and DOS 4.01 (3.*x* or 4.0 were also permissible). We asked the companies to equip their machines with a 64K RAM cache, but most vendors were able to supply only a 32K cache, while five of them offered none at all.

The 25-MHz 386 machines available today offer solid performance at enticing prices.

Two sub-$3,000 standard-configuration systems, from Computer Market Place and USA Flex, do not include processor RAM caches. Both of these systems use the noncached DTK motherboard found on DTK's own $3,995 system—also without cache. Two other systems, the $3,095 Thoroughbred 386/25 and the $3,488 Austin 386/25 Winstation, are cacheless as well. A 25-MHz machine without a RAM cache can save you money (although the National Micro Systems unit with a 170MB hard disk and a 64K cache sells for under $3,000), but you usually pay for the savings through slower performance times, as PC Magazine Labs' benchmark tests demonstrate.

Many of these companies make use of integrated video and I/O circuitry and drive controller technology to achieve a small-footprint design—which was also part of our review criteria—without severely curtailing expansion possibilities. The number of free expansion slots in these machines varied from four to six. Likewise, the different computers tested could hold three to five drives in all, with the most common configuration allowing three 5.25-inch half-height drives and two 3.5-inch devices.

Ten of the 14 computers reviewed included IDE hard disks: 3.5-inch form-factor devices that offer sub-20-millisecond access times and good capacity. Several of the units we tested came with 200MB IDE hard disks. Because the drives are small and incorporate their own controller electronics, they take up less space inside the case and open up the potential to accommodate more devices. Even if a computer doesn't have the IDE interface circuitry integrated into the motherboard and thus requires a separate interface card in an expansion slot, IDE interface boards are generally half-length cards; by contrast, ESDI, SCSI, and MFM drive controllers that combine the drive logic circuitry and interface are more often full-length cards. Half-length cards can often fit in slots close to the drives while still leaving room for bulky cabling. And they can often squeeze in next to cards (like hard cards) that are extra wide on the far end and come very near to the adjacent card space.

The 25-MHz 386 machines available today offer solid performance at increasingly enticing prices. With their small footprints and FCC Class B certification, these machines are strong candidates for both home and office use.

AUSTIN COMPUTER SYSTEMS

Austin 386/25 Winstation

by Bruce Brown

Austin's 386/25 Winstation is a system loaded with value, with the added benefit of top-level customer service and support policies. Drive and interface card expansion capacities are better than you would expect from a small-footprint case, though the 8MB maximum 32-bit memory limitation may be a drawback for some.

In our standard configuration, but sans a processor RAM cache, the Austin 386/25 Winstation lists for $3,488. This system, which was the setup we tested, includes 4MB RAM, a 175MB Seagate IDE hard disk, and a Chicony 1.2MB floppy disk drive. The unit includes Austin's standard video upgrade package consisting of a Super VGA video card using a Tseng Labs ET4000 chip set and a 14-inch Mitsubishi Diamond Scan 1,024-by-768 interlaced Super VGA color monitor. Other standard system components are one parallel and two serial ports, a 101-key keyboard (with your choice of a Chicony or Austin's own Northgate-like keyboard with the function keys on the left), DOS 4.01, *Microsoft Windows* 3.0, and a Microsoft serial mouse.

If you've got more cash to spare, and want better performance and more memory, Austin sells the same 25-MHz system with a 128K processor RAM cache and system RAM capacity of 16MB for an additional $300. Money-conscious users can get the Austin machine with 2MB RAM, a 125MB hard disk, and a standard VGA color monitor from Mitsubishi for $2,890.

The Austin case measures 6.5 by 16 by 16.5 inches (HWD), and it contains a power switch on the back and the reset button and keyboard lock on the front. There's room inside for three 5.25-inch half-height drives and two 3.5-inch half-height drives. A Seasonic 200-watt power supply with five device power leads is right for a system with all drive bays loaded.

MANAGING MEMORY

Austin makes its own motherboard, using the VIA 386 chip set and Quadtel ROM BIOS chips. The system supports both video and system ROM BIOS shadowing; both can be disabled via the CMOS setup program. The motherboard will take an Intel 80387 25-MHz math coprocessor, but not a Weitek unit.

All memory fits on the motherboard. The system accommodates either 256K or 1MB 80-nanosecond or faster SIMM modules, for a maximum of 8MB. A limit of 8MB of RAM isn't a problem for most applications today. And if you're doing heavy graphics and design work where the extra memory is needed, you probably should have your sights on a 33-MHz machine.

In all areas but memory expansion, the Austin design does very well. Of the seven expansion slots (one eight-bit, the others 16-bit), six remain free, courtesy of the motherboard's integrated I/O port and drive interface circuitry.

There's nothing very extraordinary about the Austin's benchmark test scores. Processor, memory, and disk scores were all in the midrange of the systems reviewed here. The Direct to Screen video test scores were better than average, but the Video BIOS Routine test speeds were both slow. The latter reflect the strides the industry has made in speeding up video, since Austin's video scores would have been among the top performers the last time we tested 25-MHz 386s ("The 386/25: The Midrange of Today," *PC Magazine*, July 1990).

Austin sells via mail order only. All systems come with a one-year parts-and-labor warranty, with on-site service provided through GE-Onsite. The toll-free technical support line is what you'll turn to first; if the problem is with an identifiable component, Austin ships the replacement part overnight and talks you through switching parts. The on-site service takes over when more work is required. Austin also offers a 30-day money-back guarantee on all systems.

Austin 386/25 Winstation, $3,488.

The Austin 386/25 Winstation is a fine workstation, backed by a solid company with a good reputation for customer service. Put this potential winner on your list.

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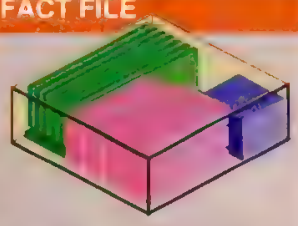

Austin 386/25 Winstation
Austin Computer Systems,
10300 Metric Blvd., Austin, TX 78758; (800) 725-1577, (512) 339-3500.
List Price: With 2MB RAM, 40MB hard disk, 1.2MB floppy disk drive, monochrome display subsystem, one parallel and two serial ports, $2,190; with 4MB RAM, 175MB hard disk, Super VGA color display subsystem, DOS 4.01, *Microsoft Windows* 3.0, Microsoft Mouse, $3,488; with 128K RAM cache, $3,788.
In Short: The Austin 386/25 Winstation capably combines average price and performance with excellent service and support policies. Memory expansion is currently limited to 8MB, but that is balanced by drive controller and I/O integration that leaves six free expansion slots.

CIRCLE 544 ON READER SERVICE CARD

BLACKSHIP COMPUTER SYSTEMS INC.

Blackship 386/25

by Bruce Brown

Blackship Computer Systems hits the competition hard with this machine. The Blackship 386/25 is priced right, its performance is very good, and Blackship's range of customer service and support policies is now competitive with the bigger and better-known mail-order companies.

The $3,865 tested system matches our standard-configuration specification, with 4MB RAM, a 201MB Maxtor 15-millisecond IDE hard disk, a 1.2MB TEAC floppy disk drive, and a Super VGA color video setup. The video combination includes a 512K Orchid ProDesigner II Super VGA adapter and a 14-inch CTX MultiScan 0.28-mm.-dot-pitch color monitor. Other components include a 101-key Key Tronic keyboard with a 90-inch

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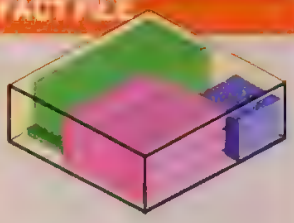

Blackship 386/25
Blackship Computer Systems Inc., 4031 Clipper Ct., Fremont, CA 94538; (800) 877-6249, (415) 770-9300.
List Price: With 1MB RAM, 32K RAM cache, 1.2MB floppy disk drive, one parallel and two serial ports, game port, Super VGA color display subsystem, $2,591; with 4MB RAM, 201MB hard disk, 512K Super VGA color display subsystem, DOS 4.01, $3,865.
In Short: The Blackship 386/25 has an average price, better-than-average performance, and fine support and service policies. With room for 16MB of RAM and five drives, this system is expandable, and overall a very good buy.

CIRCLE 545 ON READER SERVICE CARD

cable, one parallel and two serial ports, a game port, and DOS 4.01.

Blackship Computer Systems' small-footprint case, which locates the power switch on the back and the reset and turbo buttons and keyboard lock on the front, measures 6.5 by 16 by 16.8 inches. Yet the small case still provides for a decent amount of expandability. The case has space for three 5.25-inch half-height drives and two 3.5-inch drives. The power supply is a 220-watt unit, but with only four power device leads. In all, there are eight expansion slots: seven standard 16-bit slots and the last a combination slot that can hold either a 32-bit proprietary memory card or a regular 16-bit interface card. In the standard system, five expansion slots are free.

Blackship 386/25, $3,865.

MICRONICS ON BOARD

Blackship Computer Systems uses a Micronics motherboard in this system, with the Micronics ASIC 386 chip set and Phoenix ROM BIOS chips. There is a socket for either an Intel 80387 25-MHz math coprocessor or a Weitek 3167. The Micronics motherboard supports selectable video and system ROM BIOS shadowing, either of which can be set via the CMOS setup program.

The system uses an Intel 82385 cache controller chip with a 32K two-way associative copy-back processor RAM cache, expandable to 64K total. The cache chips are 25-nanosecond SRAM DIP-style chips.

You can install 4MB of system RAM on the Blackship's motherboard, using 80-ns. DRAM SIMM modules in an interleaved page arrangement, a design that fares well on PC Magazine Labs' benchmark tests. To go beyond 4MB RAM, you need the $150 memory expansion card. The card can hold a total of 16MB of RAM in the form of 1MB SIMMs (Blackship offered them for $75 per megabyte at the time of this review). But the system maximum is 16MB, so if your motherboard is full with 4MB of memory, the unit can use only 12MB on the expansion card.

The Blackship did very well on the benchmark tests, providing above-average processor and memory scores, average disk scores, and a good Direct to Screen test score. Video BIOS results were average.

GE-ONSITE

Blackship sells its systems via mail order only. The standard warranty is for one year on parts and labor. Blackship has recently signed with GE-Onsite to provide standard on-site service to its customers. Blackship also maintains toll-free technical support lines from 7:00 A.M. to 5:30 P.M., Pacific Standard Time. A seven-day unconditional money-back guarantee, and a 30-day conditional money-back guarantee if the system turns out to be inappropriate for its intended use, round out the deal.

Blackship Computer Systems' 386/25 is a fine-performing machine at a reasonable price. With strong customer service and support policies, Blackship has made this system a good buy for workstation shoppers.

COMPAQ COMPUTER CORP.

Compaq Deskpro 386/25e

by Bruce Brown

Compaq Computer Corp. has a reputation for making high-quality computers with high price tags to match. While the company reduced the cost of many of its desktop systems by about 20 percent just before this review was written, the Deskpro 386/25e will need to come down even further to compete in price with many other machines reviewed here. Configured to match our standard specifications—4MB RAM, a 32K cache, a 120MB Conner 19-millisecond IDE hard disk, a Canon 1.2MB floppy disk drive, integrated VGA circuitry, Compaq's own 14-inch VGA monitor, one parallel and one serial port, and DOS 4.01—the system sells for $6,799.

Compaq sent a fairly loaded system for this review, adding on 4MB more of RAM, a 150MB tape drive, a second 1.44MB floppy disk drive, a 25-MHz math coprocessor, and an internal 2,400-bit-per-second modem to the standard configuration. The list price of this packed system is a hefty $13,719. Fortunately, Compaq machines, which are sold only through authorized dealers, often enjoy discounts of 30 to 35 percent or more.

Price isn't the only issue here, though. While your money buys you a consider-

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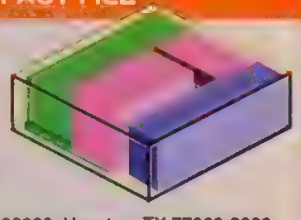

Compaq Deskpro 386/25e
Compaq Computer Corp., P.O. Box 692000, Houston, TX 77269-2000; (800) 231-0900.
List Price: With 4MB RAM, 60MB hard disk, 1.44MB floppy disk drive, VGA video adapter, one parallel and one serial port, $6,399; with 32K RAM cache, 120MB hard disk, color VGA monitor, DOS 4.01, $6,799; with 8MB RAM, 150MB tape backup, 1.2MB and 1.44MB floppy disk drives, 80387/25 coprocessor, 2,400-bps internal modem, $13,719.
In Short: The Compaq Deskpro 386/25e continues the company's tradition of rock-solid case design and construction. It's an average performer on our benchmark tests, however, except for its very fast video. This computer is high-priced even with discounts, and all service depends on the dealer.

CIRCLE 546 ON READER SERVICE CARD

Compaq Deskpro 386/25e, $13,719.

ately designed and sturdy machine, expansion room on the Deskpro 386/25e is a bit below the mark set by many other vendors of small-footprint 25-MHz 386s. Additionally, its performance on our benchmark tests was just average.

BUILT TO LAST

The Deskpro 386/25e is one of the smallest systems reviewed; its case measures 6 by 16 by 15 inches. The power switch is on the front, and the combination mechanical case and electronic keyboard lock sit on the back. The case is very well engineered, with plenty of protective panels and even little fence-like structures on the motherboard to separate the various system areas and protect them from stray signals from other chips.

There's room inside for only three 5.25-inch half-height drives and one 3.5-inch device. The power supply is an adequate 140-watt unit with four device connectors. There are five expansion slots in the system, one of which is a 32-bit memory slot and the other 16-bit slots. The four 16-bit slots were empty on the test system since the I/O, video, and drive interface electronics are all built into the motherboard.

Compaq designs and manufactures its own motherboards. This system uses discrete 386 circuitry and Compaq's own ROM BIOS. The motherboard accommodates either an Intel 80387 25-MHz or Weitek math coprocessor, supports system and keyboard password protection in ROM, but doesn't implement ROM BIOS shadowing.

The machine comes standard with 4MB RAM on the motherboard, and it can hold up to 12MB more on the optional memory expansion card, for a system maximum of 16MB. Compaq uses the Intel 82385 cache controller with a nonexpandable 32K processor RAM cache that uses 25-nanosecond SRAM cache chips.

The Deskpro 386/25e's scores on our benchmark tests are fine overall, but not as fast as you might expect from such an expensive system. The processor, memory, and disk scores were all about average except for the small-record DOS File Access test, where the machine logged in near the bottom of the pack. The unit doesn't implement video BIOS shadowing, but the video Direct to Screen test scores were the highest we tested, and the Video BIOS test results were average or better.

All systems come with a one-year standard parts-and-labor warranty. Not only does Compaq sell its systems only through authorized dealers, but potential buyers should note that they must also use the dealer channel exclusively for service and support. That policy leaves the quality of support you receive up to the individual dealer.

If you buy the Deskpro 386/25e, you'll have the comfort of knowing you're getting a well-built machine from a reputable company. For some users, that alone could make the price easier to swallow. If you're thinking of purchasing, just make sure you have a dealer with whom you feel comfortable.

COMPUTER MARKET PLACE INC.

Ultra 386-25

by Bruce Brown

If price is foremost in your computer purchase decision checklist, you're going to love this system. Computer Market Place's standard-configuration system costs just $2,620, far below the price of most of the other systems reviewed in this issue. Except for video scores, the Ultra 386-25's benchmark test results were fairly slow, however, so if fast performance counts, you should look elsewhere.

The $2,620 standard-system Ultra 386-25 includes 4MB RAM, a 200MB Conner IDE hard disk, a 1.2MB floppy disk drive, a standard VGA video display adapter with 512K of video RAM, a CTX color Super VGA monitor capable of 1,024-by-768 interlaced resolution, one parallel and two serial ports, a 101-key keyboard, and DOS 4.01.

Our test system listed for $2,899, with a smaller 100MB Conner hard disk, both 1.2MB and 1.44MB floppy disk drives, upgraded video (with a 1MB Orchid ProDesigner II card and an NEC MultiSync 3D 14-inch Super VGA color monitor), and an amazing Focus 130-key keyboard with on-board calculator, dual sets of function keys, and eight cursor control keys, including diagonal arrows to move one space and one line simultaneously. The test system also included *PC-Kwik* disk caching software.

The Ultra 386-25 uses the common DTK system motherboard, power supply, and case. The case measures 6.3 by 17 by 16.8 inches and includes bays for three 5.25-inch half-height and two 3.5-inch drives. The 200-watt DTK power supply comes with five device connectors. The case is a fairly basic unit, attractive on the outside with the power switch on the right side and turbo and reset buttons and the electronic keyboard lock on the front. Inside, the case is obviously good enough for the FCC since it has a Class B rating, but the structure support pieces, while finished, have somewhat rough edges that betray a lack of concern for inner beauty and quality.

The DTK motherboard uses discrete 386 support circuitry and DTK's own

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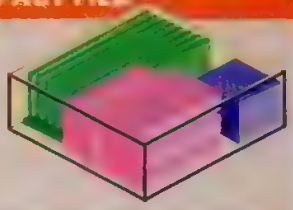


Ultra 386-25
Computer Market Place Inc., 450 Pkwy., Broomall, PA 19008; (800) 545-7397, (215) 359-0750.
List Price: With 1MB RAM, 1.2MB floppy disk drive, monochrome display subsystem, one parallel and two serial ports, $1,199; with 4MB RAM, 200MB hard disk, VGA video adapter, Super VGA color monitor, DOS 4.01, $2,620; with 100MB hard disk, 1.2MB and 1.44MB floppy disk drives, 1MB Super VGA video card, Focus 130-key keyboard with calculator, $2,899.
In Short: The Ultra 386-25 is slightly rough around the edges and relatively slow compared with others in the pack. But Computer Market Place offers good prices and an 18-month warranty. Expansion possibilities for memory, drives, and cards are adequate for this system.

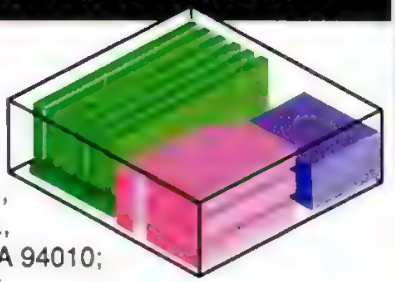
CIRCLE 547 ON READER SERVICE CARD

A Winner.

We didn't say it. PC Magazine did.

PC MAGAZINE FACT FILE

EDITORS' CHOICE



Tangent 386SX/20
Tangent Computer, Inc., 303 Beach Rd., Burlingame, CA 94010; (800)223-6677, (415) 342-9388.

List Price: With 1MB RAM, 1.2MB 5.25-inch or 1.44MB 3.5-inch floppy disk drive, one parallel and two serial ports, VGA monitor, $1,644; with 2MB RAM, 60MB hard disk, DOS 4.01, $2,278; with 105MB hard disk, $2,384.

In Short: An excellent contender with above-average electronics and hard-working peripherals, the Tangent 386SX/20 adds an FCC Class B certification to the pile to make it an extremely attractive computer for either home or office.

Standard Configuration:

- Intel 20 MHz 80386SX CPU **$2295**
- 2 MB of Memory (to 8 MB)
- 105MB 17ms Quantum Hard Disk
- Orchid ProDesigner IIe SuperVGA Card
- 14" SuperVGA Color Monitor
- Small Footprint Case w/200W Power Supply
- 5.25" or 3.5" High Density Floppy Drive
- Coprocessor Socket
- One Parallel, Two Serial, One Game Port
- 101-key Enhanced Keytronics Keyboard
- One-year Warranty with On-site Service

PC MAGAZINE EDITORS' CHOICE November 27,199 Tangent 320S

"The 20 MHz 80386SX is the new entry-level business system of choice, starting right now."
PC Magazine

Best choice of the best choices.
Here's how PC Magazine summed up the Tangent 386™SX/20 (Tangent's Model 320s):

"The Tangent 386SX packs outstanding video, expandability to 8 MB, and plenty of free slots into a nicely reduced-size case. The price is right too. This PC offers a 105 MB hard disk and Orchid's ProDesigner II Super VGA card for a mere $2295. Add in clear documentation and on-site service (with Tangent's one-year warranty) and you have a solid winner."

"The Tangent 386SX/20 is the best of the show; it garnered top scores in all of our video tests."

A system with a future. The Tangent 386SX/20 runs all of yesterday's programs. All of today's. And most important, tomorrow's. Because it implements the full Intel 80386 feature set.

Why buy their computer, when we'll build yours?
High performance. Low price, Tangent offers you a complete line of high performance systems: 20 MHz 80386, 25 and 33 MHz 80386SD, and award winning 25 and 33 MHz 80486. All, at what some people think is the best price-to-performance ratio in the business.

Built your way. Dealing with Tangent is like owning your own computer factory. Tell us exactly how you want your system configured, we'll build it, test it, and ship it. Your way. And even though it's your configuration, it carries our one-year warranty.

PC Magazine's windup: *"Add an FCC Class B rating and a one-year warranty on parts and labor that includes on-site service into the bargain, and you begin to suspect that the Tangent 386SX/20 is a winner. Consider the price/performance ratio of the computer and that suspicion starts to look like a certainty."* Bill O'Brien, PC Magazine, 11/27/90

Thanks Bill. We couldn't have said it better.

Order now, Toll Free:
1-800-223-6677

TANGENT
COMPUTER

197 Airport Blvd. Burlingame, CA 94010
Phone: 415/342-9388 FAX: 415/342-9380

CIRCLE 391 ON READER SERVICE CARD

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A FULL 32-BIT 386 LAPTOP FOR LESS

WHY PAY MORE FOR AN SX?

This is a full 32-bit system with an Intel 386 processor running at 20MHz. So it's much faster than the slower SX.

The LP/320 uses the sharpest LCD VGA super-twist screen, DRAM that's expandable to 8MB and a Conner 43MB hard drive.

And, because we believe the concept of a laptop demands portability we added a built-in rechargeable battery, so you can take it anywhere.

Of course, with a laptop this good you'd expect it to be the most expensive. It's not.

While the Compaq Portable 386 and Toshiba T5200 are priced over $8,000 each you can have the LP-320 for $2,650!

LP/320 $2,650
20MHz/LCD VGA/1MB/43MB HD

INFO WORLD "Bustin' Out" Sept 3, 1990

FREE TRW On-Site Service

Recently, the editors at InfoWorld magazine compared our new portable laptop LP-320 (setup value $3,025) to Compaq's Portable 386 (setup value $8,997) and Toshiba's T5200 (setup value $8,497). Here's some of what InfoWorld said.

1) **Speed: "Dataworld's disk-intensive total was the best"**
2) **Screen: "VGA-compatible screen that has a dark-and-bold font that is unusually sharp."**
3) **Battery: "No other system in this comparison (Compaq nor Toshiba) supports a battery."**
4) **Support: "Helpful technicians who accurately answered our questions."**
5) **Value: "The Dataworld system is a great value. This is a solid buy."**

LP320 Laptop Standard Features

- Intel 386DX 32-bit 20MHz CPU
- LCD VGA Super-Twist Screen 640 × 480
- 1MB DRAM (upgrade to 8MB)
- Conner 43MB IDE High-Speed Hard Drive & Controller Card
- 80387 & 80287 Support
- 3.5" 1.44MB floppy
- Sleep Mode to Conserve Battery Power
- 1 parallel, 2 serial ports
- Separate 10-Key Numeric Keypad
- 1 Expansion Slot
- AC Adapter
- Carrying Bag
- FastLynx Laptop-to-PC Software & Cables Kit

LP320 Laptop Optional Features

- Conners 100MB or 200MB Hard Drive
- Matsushita or NEC Full-Size VGA Monitor
- Math Coprocessor Intel or IIT
- 20MB To 500MB External Tape Back-Up
- Mouse
- Fax/Modem or Network Card
- 5.25" External Floppy

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386SX NOTEBOOKS THAT PERFORM LIKE DESKTOPS

FOR THE SAME PRICE OR LESS THAN 286 NOTEBOOKS

They're here!

Notebook size 386SX systems that can perform as well as most desktops, even though they weigh only 6.5 pounds and fit into a corner of your briefcase. But, don't confuse them with those wimpy 286 notebooks.

This is the real thing! Powerful 386 20MHz performance with up to 4MB DRAM, LCD back-lit VGA screen, built-in hard drive and floppy, 12 function keys, large enter key, and even optional modem/fax and mouse.

And all three of these notebook models offer a special "suspend mode" that let's you turn off the system and later return to your work exactly where you left off without rebooting.

Run them on their own rechargeable battery pack, or 4 rechargeable D size batteries that you can buy just about anywhere.

At the office you can add an optional expansion box with three extra slots and connect our notebook to your office LAN. Or add a full-sized VGA screen or any full-sized keyboard.

You're looking at a high-performance take-anywhere PC system!—anything else is a toy.

386SX/NB $2,650
20MHz/LCD VGA/2MB/20MB HD

386SX/NB PLUS $2,850
20MHz/LCD VGA/4MB/20MB HD

386SX/NB SUPER $2,995
20HMz/LCD VGA/4MB/20MB HD/MODEM

386SX/NB Notebook Standard Features

- Intel 386SX 20MHz CPU
- LCD VGA Back-lit Super Twist Screen 640 × 480
- Power Management Chipset
- High-Speed 20MB Hard Drive
- 80387SX Coprocessor Support
- 3.5" 1.44MB floppy
- Sleep Mode Conserves Battery Power While System Is On
- Suspend Mode To Halt And Later Resume Work
- 1 parallel, 2 serial ports
- 80-Key Keyboard
- 12 Function Keys
- Special Large Enter Key
- Connector For External 101 or PS2 Full-Size Keyboard
- Video Port For Full-Size VGA Monitor
- Uses Rechargeable D size Batteries
- 3 To 4 Hours Operation
- Leather Carrying Bag
- FastLynx Notebook-to-PC Software & Cables
- Only 6.5 Pounds
- Size: 9" × 11" × 2.5"
- MS-DOS 4.01

ASK ABOUT WINDOWS 3.0 & MOUSE

386SX/NB Notebook Optional Features

- Matsushita or NEC Full-Size VGA Monitor
- 80387SX Math Coprocessor
- Mouse
- Internal Fax/Modem
- 3 Slot Expansion Box
- Automobile Lighter Power Adapter
- Second Battery With Charger

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BIOS chips. The system supports both video and system ROM BIOS shadowing and has setup and system password security in CMOS. Either an Intel 80387 25-MHz or a Weitek math coprocessor chip is supported, but not both simultaneously. This motherboard does not use a processor RAM cache.

The system takes up to 4MB RAM on the motherboard using 80-nanosecond page-mode memory SIMM modules and another 12MB maximum on a proprietary 32-bit memory expansion card. In all there are eight expansion slots, two 8-bit, five 16-bit, and one 32-bit slot used either for the memory card or for an 8-bit interface card.

The Ultra 386-25's benchmark test scores aren't very good, except for excellent performance from the upgraded video card. Otherwise memory, processor, and disk test results are all in the bottom part of the test range. The numbers don't reveal anything particularly abnormal about the system, but don't buy this box for speed.

Computer Market Place sells systems à la carte via mail order only. Its price list

25-MHz 386-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order

Price of standard configuration For this review of 25-MHz 386 computers, we requested a standard configuration including 4MB RAM, a 64K RAM cache, a 150MB hard disk, one high-density floppy disk drive, a color VGA video display subsystem, at least one parallel and two serial ports, a keyboard, and DOS. In some instances, manufacturers do not offer the exact configuration *PC Magazine* requested, but all 14 of the PCs reviewed here provide a reasonably close match for this list of requirements.

All table entries except **price of standard configuration** describe the features of the systems *PC Magazine* actually tested. Refer to each fact file for the price of the tested configuration.

Distribution channel Some machines are sold directly through mail order. When machines are sold by dealers, the purchaser may find discounts of 25 percent or more off the list price (although there is no guarantee that the discounts will run this high).

386 chip set manufacturer indicates which company makes the support logic that connects the CPU with the other functions managed by the system board. In some cases the computer uses discrete logic rather than a chip set.

The **system RAM arrangement** is the method in which memory is addressed. The design of system RAM aims at avoiding the wait states imposed when CPU speed outpaces conventional memory speed.

Interleaved memory increases processing speed by dividing the memory into two or four portions that process information alternately. The CPU sends information to one section for processing while another section goes through a refresh cycle.

Page-mode memory allows back-to-back memory accesses within blocks of memory called pages, avoiding wait states.

Row column is the traditional method of accessing data at a memory address. RAM is mapped as a matrix, and a particular address is given using a row and a column number.

Maximum installable 32-bit RAM Separate rows indicate the maximum 32-bit memory possible on the motherboard and on a dedicated memory board.

RAM packaging (and rated speed) Memory chips come in a variety of styles: DIPs, SIPs, and SIMMs.

The *dual in-line package (DIP)* is the traditional computer chip sprouting 8, 14, 24, 40, or more metal legs (evenly divided between right and left sides).

Single in-line packages (SIPs) are single-package arrays of computer chip logic assembled so that all connecting legs are in a straight line, like the teeth on a comb. They can be individual chips or multiple chips on a small card, with a proprietary SIP connection.

Single in-line memory modules (SIMMs) consist of individual logic devices installed on their own small circuit board, creating a component module that can be plugged into a larger device. Their physical arrangement facilitates easy installation and replacement.

Installed chip size Kb and Mb refer to kilobits and megabits, respectively. Combination chips (4x256Kb) are generally faster and more expensive.

The **BIOS version and date** can affect PC Magazine Labs' benchmark test results. Those purchasing the same machine with a different BIOS version may encounter some variations in performance.

Setup can reside either on a floppy disk or in ROM.

Shadowing Shadow RAM is a technology that loads video BIOS or system BIOS directly into fast RAM on boot-up of the computer, offering enhanced performance speed. It uses a segment of system memory located between the boundary of conventional memory (640K) and the end of the first megabyte of installed RAM. The ability to disable shadowing is important with some applications to resolve memory conflicts.

Hard disk interface Within the 386 PC environment, the most common hard disk interfaces are *IDE (integrated drive electronics)*, *SCSI (small computer system interface)*, and *ESDI (enhanced small device interface)*. With an IDE interface, the drive contains its own controller electronics; by contrast, each non-IDE hard disk in this roundup has its controller on a card. IDE can offer good performance at a lower price than ESDI or SCSI.

Hard disk options The number of different hard disks the vendor offers for a machine is often indicative of how much customizing is available.

Bus speeds Bus speed becomes more important as computers run at faster clock speeds. A computer's bus speed may actually be too fast for expansion cards, most of which operate at 8 MHz.

Slots free in fully configured PC indicates the number of open slots after hard and floppy disk drives, a display subsystem, and one parallel and two serial ports are installed.

The **display circuitry** can be located either on an expansion card or on the computer's motherboard. Motherboard circuitry is often faster, but if it cannot be disabled it prevents upgrades.

Video interface 16-bit video interfaces are typically faster than 8-bit because of their wider bandwidth. All of the computers in this roundup have 16-bit video interfaces.

DOS The availability and price of DOS 3.3 and 4.01 are listed here. If no price is shown, the base-priced system includes DOS. (*PC Magazine*'s standard configuration includes DOS 4.01—or, if it is not available, DOS 3.3—to allow more-accurate price comparisons.)

Where **OS/2** is available, the version number and list price are provided.

Disk caching software Some companies provide software to facilitate data retrieval from the hard disk. This software speeds overall system performance by anticipating what data the processor will need next.

An **expanded memory manager** is software that emulates the Lotus/Intel/Microsoft (LIM) expanded memory manager within the extended memory of a 386 PC.

Other software is listed if it is bundled free of charge or at a nominal cost.

Weitek 3167 support Popular math coprocessors include the Intel 80387 and the Weitek 3167. All of the reviewed systems include a socket for an Intel 80387 chip, but some lack support for the Weitek 3167.

Dual voltage on the power supply permits a computer's use in both the United States and Europe. All of these computers have this feature.

Number of device connectors indicates how many internal storage devices the system can support without the use of Y cables (power splitters).

FCC certification class The FCC (Federal Communications Commission) rates computers based on radio-frequency emission levels. A Class A rating signifies that a computer has sufficiently low emissions for operation in a business locale. The more stringent Class B rating allows home use as well, where computers are likely to be placed near radios and television sets. All computers in this roundup have Class B certification.

CONTINUES

How to make the work go faster and the money go slower.

NEC PowerMate 386/25S. The affordable entry to high performance 386 processing.

For advanced applications like CAD/CAM, presentation graphics or financial modeling, you can't go wrong with the PowerMate® 386™/25S. For far less than comparable 386 systems, you get 25MHz speed, 2MB of RAM (easily expandable to 16MB via SIM modules) and a 32K memory cache. You also get something you can't get from anyone else at any price: NEC. For more information call 1-800-NEC-INFO.

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CIRCLE 157 ON READER SERVICE CARD

25-MHz 386-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order

	Austin 386/25 Winstation	Blackship 386/25	Compaq Deskpro 386/25e	Computer Market Place Ultra 386-25	Dell System 325D	DTK Keen-2530
Price of standard configuration	$3,488	$3,865	$6,799	$2,620	$4,318	$3,995
Distribution channel	Direct	Direct	Dealers	Direct	Dealers, direct	Dealers
Dimensions (HWD, in inches)	6.5 x 16 x 16.5	6.5 x 16 x 16.8	6 x 16 x 15	6.3 x 17 x 16.8	6 x 16 x 16	6.1 x 16.9 x 16.5
Motherboard manufacturer	Austin	Micronics	Compaq	DTK	Dell	DTK
386 chip set manufacturer	VIA	Micronics	Compaq	Discrete logic	VLSI Tech	Discrete logic
System RAM arrangement	Interleaved, page-mode	Interleaved, page-mode	Page-mode	Page-mode	Interleaved, page-mode	Static column
Wait states	0	0	0	1	1	0
Installable RAM (minimum–maximum)	1MB–8MB	1MB–16MB	4MB–16MB	1MB–16MB	1MB–16MB	1MB–16MB
MOTHERBOARD MEMORY						
Maximum installable 32-bit RAM	8MB	4MB	16MB	4MB	16MB	8MB
Installed RAM	4MB	4MB	4MB	4MB	4MB	4MB
RAM packaging (and rated speed)	SIMM (70 ns.)	SIMM (80 ns.)	DIP (100 ns.)	SIMM (80 ns.)	SIMM (80 ns.)	SIP (80 ns.)
Installed chip size	1Mb	1Mb	1Mb	1Mb	1Mb	4x256Kb, 1Mb, 2Mb
Other chips supported	256Kb	256Kb	None	256Kb	4Mb	4Mb
ADD-IN MEMORY BOARD						
Maximum installable 32-bit RAM	N/A	16MB	16MB	12MB	N/A	16MB
Installed RAM	N/A	None	4MB	None	N/A	None
RAM packaging (and rated speed)	N/A	SIMM (80 ns.)	DIP (100 ns.)	SIMM (80 ns.)	N/A	SIMM (80 ns.)
Installed chip size	N/A	N/A	1MB	N/A	N/A	N/A
Other chips supported	N/A	256Kb, 1Mb	None	1Mb	N/A	256Kb, 1Mb
PROCESSOR RAM CACHE						
Cache controller	N/A	Intel	Intel	N/A	Austek	N/A
Installed RAM	N/A	32K	32K	N/A	32K	N/A
Installable RAM options	N/A	32K, 64K	32K	N/A	32K	N/A
RAM packaging (and rated speed)	N/A	DIP (25 ns.)	DIP (25 ns.)	N/A	DIP (35 ns.)	N/A
Installed chip size	N/A	8Kb	8Kb	N/A	8Kb	N/A
BIOS						
BIOS version and date	Quadtel 3.04.03 (May 1990)	Phoenix 1.10 M8 (January 1988)	Compaq (January 1990)	DTK 4.26 (June 1990)	Phoenix/Dell 1.10 A02 (September 1990)	DTK 4.26 (June 1990)
Setup/password in ROM	■ / ❑	■ / ❑	❑ / ■	■ ■	■ ■	■ ■
Video shadowing/Can be disabled	■ ■	■ / ■	■ ■	■ ■	■ ■	■ ■
System shadowing/Can be disabled	■ ■	■ ■	❑ / ❑	■ ■	■ ■	■ ■
HARD DISK						
Manufacturer	Seagate	Maxtor	Conner	Conner	Maxtor	Maxtor
Disk capacity	175MB	201MB	120MB	100MB	190MB	150MB
Interface	IDE	IDE	IDE	IDE	IDE	ESDI
Controller manufacturer	N/A	N/A	N/A	N/A	N/A	Adaptec
Integrated floppy/hard disk controller	❑	❑	■	❑	❑	■
Drive bays	3 half-height, 2 3.5-inch	3 half-height, 2 3.5-inch	4 one-third-height, 1 half-height	3 half-height, 2 3.5-inch	3 half-height, 1 3.5-inch	3 half-height, 2 3.5-inch
Hard disk options	330MB, 660MB (ESDI); 40MB, 85MB, 110MB, 175MB (IDE)	158MB, 330MB, 676MB (ESDI); 80MB, 200MB (IDE)	110MB, 120MB (IDE); 210MB, 320MB (SCSI)	320MB (ESDI); 80MB, 110MB, 200MB (IDE)	330MB, 650MB (ESDI); 40MB, 80MB, 100MB (IDE)	300MB (ESDI); 300MB (SCSI)
FLOPPY DISK DRIVES						
Type	1.2MB	1.2MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB, 1.44MB	1.2MB
Manufacturer	Chinon	TEAC	Citizen	TEAC	Mitsubishi, Sony	TEAC

—Editors' Choice ■—Yes ❑—No

N/A—Not applicable: The product does not have this feature.

AMI—American Megatrends Inc., C&T—Chips and Technologies Inc., VLSI Tech—Very Large Scale Integration Technologies Inc.

EasyData 325HI	HP Vectra 386/25	National Micro Systems Flash 386-25	NEC PowerMate 386/25S	Olivetti M386/25	Thoroughbred 386/25	Twinhead Superset 600/25c	USA Flex 386/25
$4,599	$7,248	$2,799	$7,572	$8,865	$3,290	$4,990	$2,790
Dealers	Dealers	Direct	Dealers	Dealers, direct	Direct	Direct	Direct
7 x 14.8 x 16	6.3 x 16.7 x 15.7	7 x 14.8 x 16.3	5 x 17 x 16	6 x 16.3 x 16	6.5 x 17.8 x 15.6	5.5 x 15.8 x 15.5	6.5 x 17.3 x 15.5
Easy Data	Hewlett-Packard	AMI	NEC	Olivetti	DTK	Twinhead	DTK
Discrete logic	C&T	Discrete logic	Headland Phoenix/NEC	Olivetti	Discrete logic	C&T	Discrete logic
Row/column	Page-mode	Interleaved	Interleaved	Page-mode	Page-mode	Interleaved, page-mode	Page-mode
0	0	0	0	0	0	0	0
1MB–16MB	2MB–32MB	2MB–16MB	2MB–16MB	2MB–10MB	2MB–16MB	2MB–16MB	2MB–16MB
N/A	32MB	8MB	N/A	10MB	8MB	8MB	8MB
N/A	4MB	4MB	N/A	4MB	4MB	4MB	4MB
N/A	SIMM (80 ns.)	DIP, SIMM (80 ns.)	N/A	DIP, SIMM (80 ns.)	SIMM (80 ns.)	SIMM (60 ns.)	SIP (80 ns.)
N/A	2Mb	1Mb	N/A	1Mb	1Mb	1Mb	1Mb
N/A	8Mb	256Kb, 4Mb	N/A	4Mb	256Kb, 4Mb	256Kb, 4Mb	256Kb, 4Mb
16MB	N/A	8MB	16MB	8MB	8MB	8MB	8MB
4MB	N/A	None	4MB	None	None	None	None
SIMM (100 ns.)	N/A	SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)	SIMM (80 ns.)
1MB	N/A	N/A	1Mb	N/A	N/A	N/A	N/A
None	N/A	256Kb, 1Mb, 4Mb	256Kb	1Mb, 4Mb	256Kb, 1Mb, 4Mb	256Kb, 1Mb, 4Mb	256Kb, 1Mb, 4Mb
Intel, discrete logic	C&T	Discrete logic	Intel	Intel	Discrete logic	Intel	N/A
32K	32K	64K	32K	32K	None	64K	N/A
4K–32K	32K	32K, 64K	32K	32K	64K, 256K	64K	N/A
SIMM (25 ns.)	SIMM (20 ns.)	DIP (25 ns.)	DIP (25 ns.)	DIP (25 ns.)	SIMM (25 ns.)	DIP (25 ns.)	N/A
8Kb	16Kb	4x16Kb	8Kb	1x16Kb	N/A	4x16Kb	N/A
AMI (March 1990)	HP J.0301 (September 1990)	AMI 3.0 (April 1990)	Phoenix 1.10.40 (January 1988)	Olivetti (May 1990)	DTK 4.26 (June 1990)	Phoenix 1.10 22 (April 1990)	Phoenix 1.10.10 (1989)
■ ❑ ■ ■ ■ ■	■ / ❑ ■ ■ ■ ❑	■ / ❑ ■ ■ ■ ■	❑ ■ ■ ■ ■ ■	■ / ■ ■ ■ ■ ■	■ ■ ■ ■ ■ ■	■ ❑ ■ ■ ■ ■	■ ■ ■ ■ ■ ■
Seagate	Quantum	Maxtor	NEC	Conner	Conner	Conner	Toshiba
150MB	84MB	170MB	148MB	200MB	200MB	200MB	100MB
ESDI	IDE	ESDI	ESDI	IDE	IDE	IDE	IDE
UltraStor	N/A	Western Digital	Western Digital	N/A	N/A	N/A	N/A
■	■	■	■	❑	❑	❑	❑
3 half-height, 2 3.5-inch	3 half-height	3 half-height, 2 3.5-inch	2 half-height, 1 3.5-inch	1 half-height, 4 3.5-inch	3 half-height, 2 3.5-inch	2 one-third-height, 1 half-height	3 half-height, 2 3.5-inch
150MB, 300MB, 600MB (ESDI); 120MB (IDE)	120MB, 168MB, 336MB (ESDI)	350MB, 750MB (ESDI); 200MB (IDE)	148MB (ESDI); 100MB (IDE)	100MB (IDE)	100MB (IDE)	100MB, 150MB, 200MB (IDE)	300MB, 600MB (ESDI); 200MB (IDE)
1.44MB, 1.2MB	1.2MB	1.2MB	1.2MB	1.44MB	1.2MB, 1.44MB	1.2MB	1.2MB, 1.44MB
YE Data	Hewlett-Packard	YE Data	NEC	Panasonic	TEAC	Canon	TEAC

CONTINUES

Computer Market Place Ultra 386-25, $2,899.

lets you choose case, motherboard, power supply, drives, video, I/O cards, operating systems, and just about any other component or accessory. If the standard system price seems low, it just reflects the vendor's pricing policy, which cuts profits close to the bone.

If you assume such low component prices mean poor service and support policies, you're in for a pleasant surprise. Computer Market Place backs all systems with a one-year parts-and-labor warranty and, in this case, 18 months on the motherboard. Service is provided via a toll-free technical support number and backed by standard on-site service from Phoenix Service Technology. To cap it off, Computer Market Place offers a longer-than-usual 45-day money-back guarantee.

The Ultra 386-25 isn't the fastest 25-MHz system you can buy, but it may be the least expensive computer that also comes with terrific service and support backing. If you need a 386 but don't care about the very fastest times, check this one out and you just might save yourself some money.

DELL COMPUTER CORP.

Dell System 325D

by Bruce Brown

If you're in the market for a 25-MHz 386 that's fast, well-made, reasonably priced, and backed by a company with a fine reputation for service and support, you may not need to look any further than the Dell System 325D.

Our test machine was set up to match our standard configuration specifications with one exception: It came with two floppy disk drives. With a single 1.2MB floppy disk drive, 4MB RAM, a 32K processor RAM cache, a 190MB Maxtor 15-millisecond IDE hard disk, on-board Super VGA adapter, Dell's CV-3 0.28-

25-MHz 386-BASED PCs: SUMMARY OF FEATURES

Products listed in alphabetical order

	Austin 386/25 Winstation	Blackship 386/25	Compaq Deskpro 386/25e	Computer Market Place Ultra 386-25	Dell System 325D	DTK Keen-2530
[illegible]						
Bus speeds (MHz)	8	8, 12.5	8	8	8	8
Slots (8-, 16-, 32-bit)	1, 6, 0	0, 7, 1	0, 5, 1	2, 5, 1	1, 5, 0	2, 5, 1
Slots free in fully configured PC	6	5	4	5	6	5
Ports originate on motherboard	■	❑	■	❑	■	❑
[illegible]						
Display circuitry location	Card	Card	Motherboard	Card	Motherboard	Card
Manufacturer	Austin	Orchid	Compaq	Orchid	Western Digital	DTK
Chip set manufacturer	Tseng	Tseng	Compaq	Tseng	Western Digital	Trident
[illegible]						
Keyboard manufacturer	Austin	Key Tronic	Compaq	Focus	Alps	Chicony
Number of keys, function keys	101, 12	101, 12	101, 12	130, 24	101, 12	101, 12
Keyboard cable length (inches)	84	90	144	90	100	60
Mouse port	❑	❑	■	❑	■	❑
SOFTWARE						
DOS	4.01	3.3, 4.01 ($80)	4.01 ($150)	4.01 ($99)	4.01 ($119)	4.01
OS/2	None	None	1.21 ($340)	None	1.1 ($299)	None
Disk caching software	None	None	Compaq	None	None	None
Expanded memory manager	None	MICEMM 386	CEMM	None	HW LIM 4.0	None
Other	*Windows* 3.0	None	None	None	None	None
MISCELLANEOUS						
Weitek 3167 support	❑	■	■	■	■	■
Physical features:						
Power supply (watts)	200	220	140	200	177	200
Number of device connectors	5	4	4	5	5	4
Keyboard/case lock	Front/none	Front/none	Back/back	Front/none	Back/back	Front/none
Power-on/reset switch	Back/front	Back/side	Front/none	Side/front	Front/front	Side/front
Warranty	1 year	1 year	1 year	18 months motherboard, 1 year other parts	1 year	1 year
Service	On-site	Dealer, on-site	Dealer	Dealer, on-site	Phone service, on-site backup	Dealer

—Editors' Choice ■—Yes ❑—No

mm.-dot-pitch Super VGA color monitor, one parallel and two serial ports, a 101-key keyboard, and DOS 4.01, the machine costs $4,318. Adding the second floppy disk drive, a 1.44MB device, raises the price to $4,417.

The compact Dell case measures 6 by 16 by 16.3 inches, and locates the power and reset switches on the front, and the combination case and keyboard lock on the back. A SmartVu digital display reveals operating and status codes. The case opens via three finger screws on the back. Inside, it reveals careful consideration for users, with a clear illustration of all system components attached to the top of the drive chassis.

The case has room for three 5.25-inch half-height storage devices and one internal 3.5-inch drive bay, one less than some other vendors' systems accommodate. The 170-watt power supply has four device power leads. With the drive interfaces, video, and I/O ports built into the motherboard, all six slots—one 8-bit and five 16-bit—remain free.

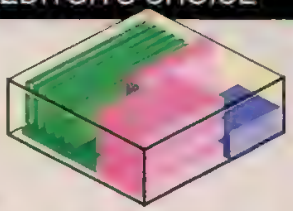
Dell's motherboard runs at either 8 or 25 MHz, and uses a VLSI brand 386 chip set and a Phoenix/Dell ROM BIOS. Both video and system ROM shadowing are supported, as is a BIOS level system password. The unit has a socket for either an Intel 80387 25-MHz or Weitek 3167 math coprocessor chip.

An Austek cache controller chip runs the 32K of 35-nanosecond two-way associative copy-back processor RAM cache. The cache size is not expandable. All system memory fits on the motherboard, with up to 16MB possible using 80-ns. page-mode SIMM memory modules.

The Dell System 325D shines on PC Magazine Labs' benchmark tests. On every test—processor, memory, disk, video—it scored in the top third of its field. There's no question about it; this is a fast machine.

Dell, which helped to legitimize mail-

FACT FILE
EDITOR'S CHOICE



Dell System 325D
Dell Computer Corp., 9505 Arboretum Blvd., Austin, TX 78759-7299; (800) 426-5150, (512) 338-4400.
List Price: With 1MB RAM, 40MB hard disk, 1.2MB floppy disk drive, VGA monochrome display subsystem, one parallel and two serial ports, $2,749; with 4MB RAM, 32K RAM cache, 190MB hard disk, Super VGA color display subsystem, DOS 4.01, $4,318; with 1.2MB and 1.44MB floppy disk drives, $4,417.
In Short: The Dell System 325D has an average price, but it scores high in all other respects. One of the fastest tested machines, this impressive unit is backed by Dell's proven service and support policies.

CIRCLE 548 ON READER SERVICE CARD

EasyData 325HI	HP Vectra 386/25	National Micro Systems Flash 386-25	NEC PowerMate 386/25S	Olivetti M386/25	Thoroughbred 386/25	Twinhead Superset 600/25c	USA Flex 386/25
8	8	8	8.33	8	8	8	8
2, 5, 1	1, 6, 0	2, 6, 0	0, 4, 1	0, 5, 0	3, 5, 1	0, 4, 0	2, 5, 1
5	5	5	4	5	5	4	5
❑	❑	❑	■	■	❑	■	❑
Card	Card	Card	Card	Motherboard	Card	Motherboard	Card
Genoa 3500	Headland	Ahead	Western Digital	C&T	Orchid	Twinhead	Ultimate
Paradise	Headland	Ahead	Western Digital	C&T	Tseng	Paradise	Tseng
Honeywell	Hewlett-Packard	Maxi-Switch	NEC	Olivetti	Focus	Focus	Fujitsu
101, 12	101, 12	101, 12	101, 12	101, 12	101, 12	101, 12	101, 12
60	60	84	80	72	84	84	84
❑	■	❑	■	■	❑	❑	❑
3.3, 4.01	4.01 ($150)	4.01	3.3, 4.01	4.01	4.01	4.01	4.01
1.1 ($149)	1.1 ($369)	None	None	None	None	None	1.1 ($599)
None	HP DCache	None	None	None	None	None	Smartdrv.Sys
Quadtel	EMM 386	None	None	*QEMM-386*	None	None	HIMEM.SYS
None	None	None	*Windows* 3.0	None	None	None	*Windows* 3.0
■	■	■	■	■	■	■	■
220	134	200	110	130	200	140	200
5	5	4	3	4	5	5	5
Front/none	Front/front	Front/none	None/none	None/front	Front/none	Front/none	Front/none
Front/none	Front/none	Front/front	Front/none	Front/front	Side/front	Front/front	Side/front
1 year	1 year	1 year	1 year	1 year	1 year parts, 2 years labor	1 year	1 year
Dealer, on-site	On-site	Phone service, on-site backup	Dealer	Dealer	Phone service, on-site backup	Phone service, on-site backup	Phone service, on-site backup

ENDS

Finally, someone brings to a wider

To: **Mike Rogers, President**

From: **Chris Caldwell, Office Mgr.**

M I K E ' S
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Great news! For about the same price we were going to pay for that dot-matrix printer, we can get this new wide-carriage **IBM ExecJet** printer, an inkjet that will give us quiet, laser-quality output, more fonts and much faster printing.

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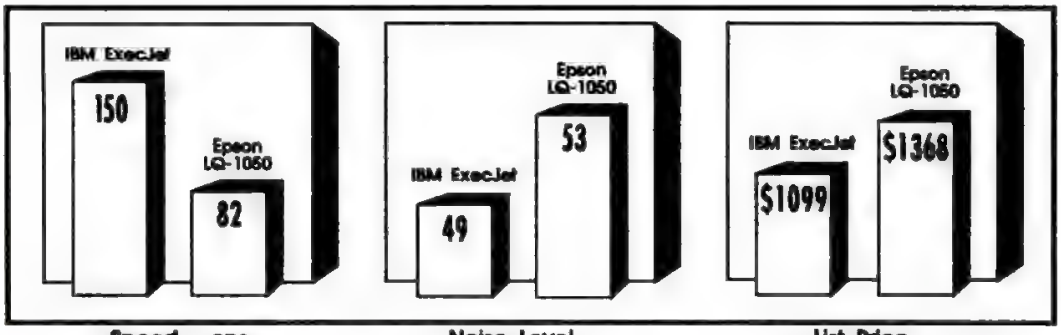

Speed - cps
Letter Quality Mode

Noise Level
Decibels

List Price
With Paper Bin

Please let me know if you have any questions on the above information. I'm ready to place the order.

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16½″

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Print Technology		inkjet	dot matrix
Speed – Letter Quality	✓	150 cps	82 cps
Noise Level	✓	49 decibels	53 decibels
Cut Sheet Paper Bin	✓	standard	$269 option
Print Quality		360 dots/inch	360 dots/inch
Std. Letter Quality Fonts	✓	18	12
Print Buffer Size	✓	30Kb – 20 pp.	6Kb – 4 pp.
Emulation	✓	Epson, IBM	Epson
Mfr. Sugg. Retail Price	✓	$1099	$1099
W/ Cut Sheet Paper Bin	✓	$1099	$1368

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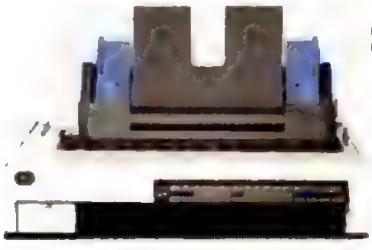


Suddenly, nothing else measures up.

IBM

Dell System 325D, $4,417.

order computer sales in 1985, still sells largely via mail order, but recently also started selling through the Soft Warehouse chain of computer superstores. However you buy the machine, all service and support is provided by the manufacturer. Dell includes on-site service from Xerox during the one-year parts-and-labor warranty period, provides toll-free technical support, and offers a 30-day money-back guarantee. Dell consistently gets good ratings from purchasers who have experience with the company's support and service departments.

You can pay less and you can get less. You can also pay more and not get as much. If you think this all sounds like an unqualified recommendation for the Dell System 325D, you're absolutely right.

DTK COMPUTER INC.

DTK Keen-2530

by Fredric Burke

DTK Computer has been a fixture on the PC scene for some time now; in addition to its own machines, it is also known throughout the industry for providing various components to other PC vendors. A conservatively executed machine, the 25-MHz DTK Keen-2530 provides reasonable performance at an acceptable if not rock-bottom price. In *PC Magazine*'s standard configuration, including 4MB of RAM, a 150MB hard disk, a 1.2MB floppy disk drive, a Super VGA display subsystem, and a Chicony keyboard, the DTK Keen-2530 sells for $3,995.

Inside its 6.1- by 16.9- by 16.5-inch small-footprint chassis, DTK's position as a component manufacturer is evident. It builds both the motherboard and the discrete logic circuitry, replacing a more conventional 386 chip set, and also supplies the BIOS. The microprocessor is switchable, running at either 10 or 25 MHz, while the bus moves along at a more sedate 8 MHz. The motherboard will support an 80387 or a Weitek 3167, though not simultaneously.

Something that the DTK motherboard doesn't share with many of its competitors is a processor RAM cache. DTK does not install one in this Keen because the motherboard with cache will not fit into the small-footprint chassis. Those who must have the Keen-2530 with a cache must plunk down extra money for either the full-size desktop machine or the tower chassis.

The Keen-2530 was built with generous RAM expansion capabilities. While the evaluated system came with 4MB, the motherboard will support up to 8MB in 80-nanosecond SIPs, packaged in a combination of 256K and 1MB chips. Another 16MB of 80-ns. SIMMs can be added to the system through the purchase of a $150 proprietary 32-bit expansion card, bringing the total to 24MB of fairly fast RAM. DTK charges $125 per megabyte for RAM upgrades.

Users will find that the Keen-2530 has ably provided for drive bay expansion. Three half-height and two 3.5-inch bays provide ample room for mass storage options. DTK employs proven components for mass storage needs; the review machine was equipped with Maxtor's 150MB ESDI hard disk and a 1.2MB TEAC floppy disk drive. Also available from the company are 80MB and 100MB IDE hard disks at $675 and $775, respectively, and 150MB and 300MB ESDI hard disks for $1,495 and $2,095.

The Keen-2530's expansion chassis doesn't offer quite as much room to grow. Besides the proprietary 32-bit slot, the motherboard allows room for two 8-bit and five 16-bit slots. Fully configured, with an 8-bit I/O, an Adaptec combined hard and floppy disk drive controller, and DTK's 16-bit video card with the Trident chip set (hooked to a Panasonic Panasync 1381 VGA monitor), there remain a single 8-bit and three 16-bit slots.

DTK is not too generous in the software it bundles with the unit: DOS 4.01 is the only offering. The warranty for the unit is the standard one year on parts and labor; systems in need of service must be shipped back to the factory.

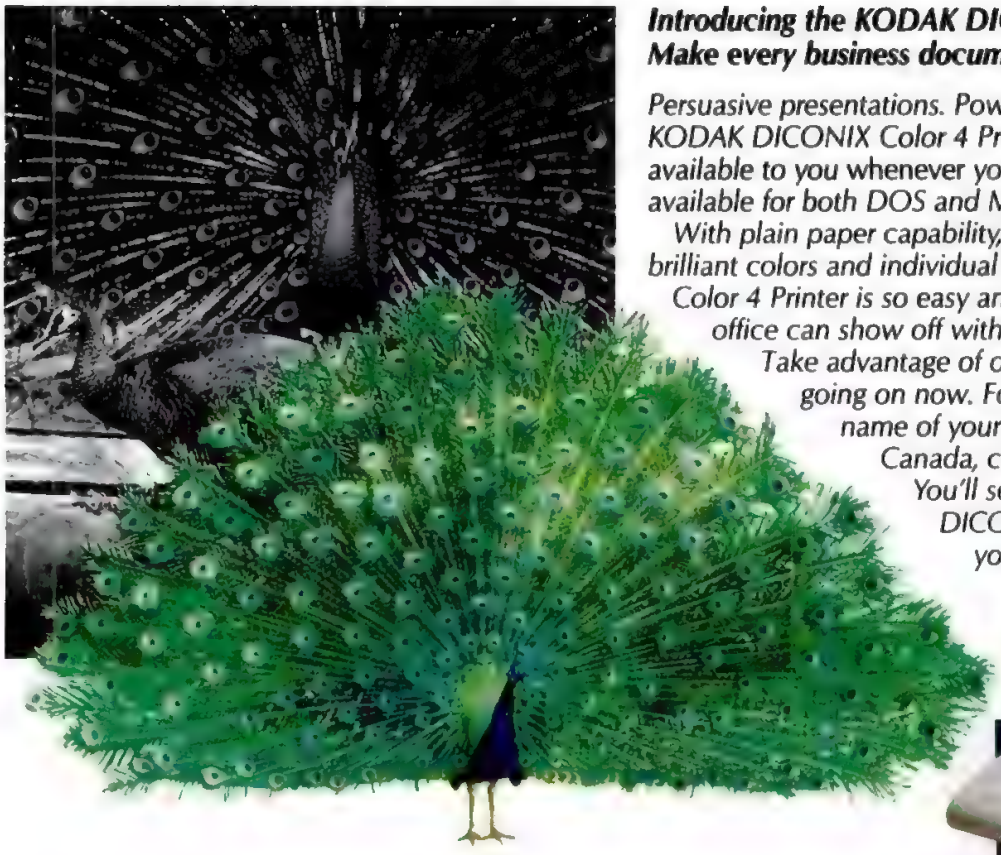
DTK Keen-2530, $3,995.

DTK's unwillingness to design a cache motherboard for the small-footprint Keen-2530 puts a real crimp in its performance. At PC Magazine Labs, the Keen came in dead last on the Conventional Memory test. (It did, however, take first place on the large-record DOS File Access test.) The lack of a RAM cache shortchanges a machine that is well-constructed and rugged, and whose components are of high quality. Though users will find many things to like about the DTK Keen-2530, absolute top-flight 25-MHz performance is not among them.

FACT FILE

DTK Keen-2530
DTK Computer Inc., 15711 E. Valley Blvd., City of Industry, CA 91744; (818) 333-7533.
List Price: With 4MB RAM, 100MB hard disk, 1.2MB floppy disk drive, VGA color display subsystem, DOS 4.01, $3,275; with 150MB hard disk, Super VGA color display subsystem, one serial and one parallel port, $3,995.
In Short: Sturdy and well thought out, the DTK Keen-2530 is a fine machine looking for a little bit extra. It came in first on one disk benchmark test and last on the Conventional Memory test. The lack of a cache works against it.

CIRCLE **549** ON READER SERVICE CARD



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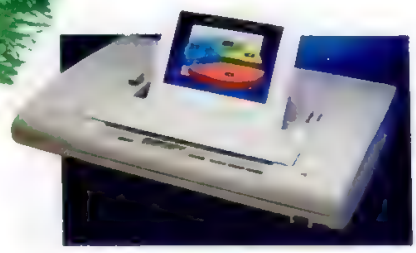

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CIRCLE 363 ON READER SERVICE CARD

BENCHMARK TESTS: 25-MHz 386-BASED PCs

Processor RAM cache, whether 32K or 64K, adds speed to a 386/25. The five noncached systems in our review showed significantly slower processor and memory scores than any cached system. The Dell System 325D, Blackship 386/25, and Twinhead Superset 600/25c, all cached systems, showed the best processor and memory scores.

For this issue we tested 14 25-MHz 386 computers, using the PC Magazine Labs Benchmark Series–Hardware Performance Tests, Release 5.6. We ran the tests with video and system shadowing enabled whenever possible, and we left the buffers at their default values. We performed the disk benchmark tests without software disk caches.

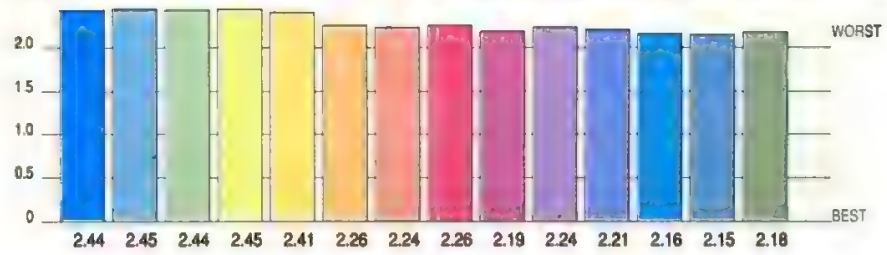
The margin of error for the processor, memory, and video benchmark tests is 0.05 seconds, so take this into account when making purchasing decisions based primarily on speed.

PROCESSOR AND MEMORY BENCHMARK TESTS

80386 Instruction Mix

Elapsed Time (seconds)

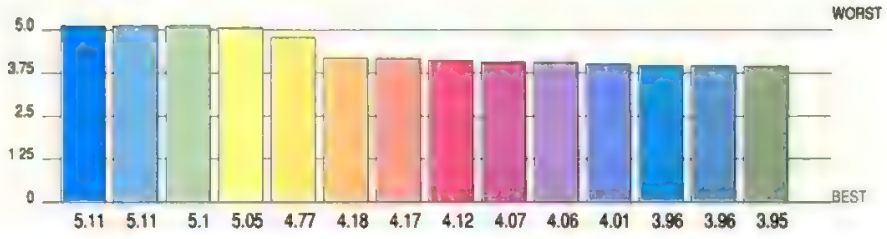
The **80386 Instruction Mix** benchmark test times a series of tasks specific to the 80386 chip. Since this test shows how the CPU operates in the context of the bus, processor, system memory, and motherboard architecture, a faster time means better overall computer performance.



Floating-Point Calculation Without Coprocessor

Elapsed Time (seconds)

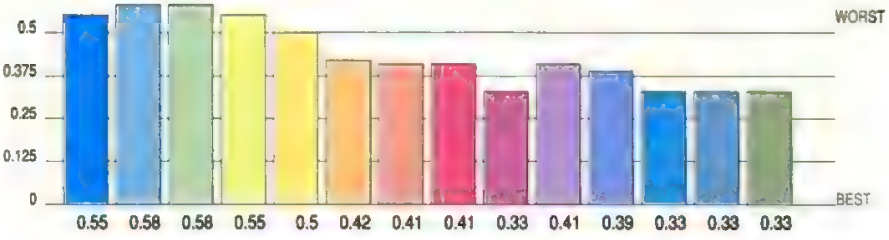
The **Floating-Point Calculation Without Coprocessor** benchmark test sets up a floating-point emulation program in RAM and then exercises the processor and tests RAM access speeds during floating-point calculations.



Conventional Memory

Elapsed Time (seconds)

The **Conventional Memory** benchmark test measures the read/write speed of the first 640K of memory. Slower relative times can indicate the presence of memory wait states or memory chips rated at slower access speeds.

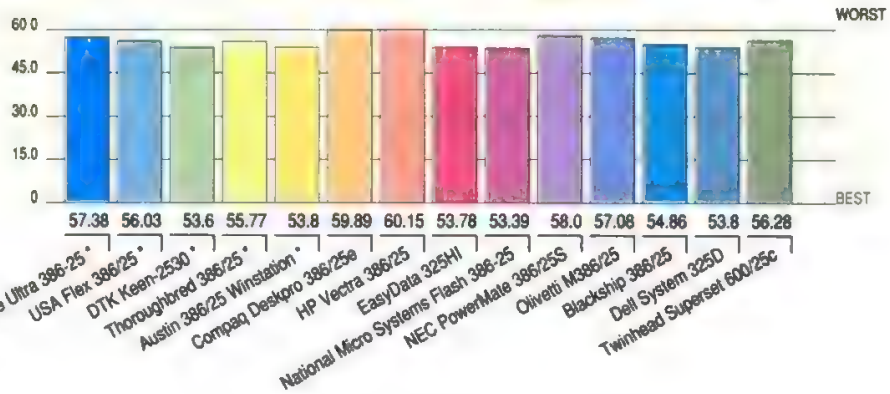


DISK BENCHMARK TESTS

DOS File Access (Small Records)

Elapsed Time (seconds)

The **DOS File Access (Small Records)** benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. The test is performed without software disk caching. Fast times are advantageous for programs that work with many short segments of data.



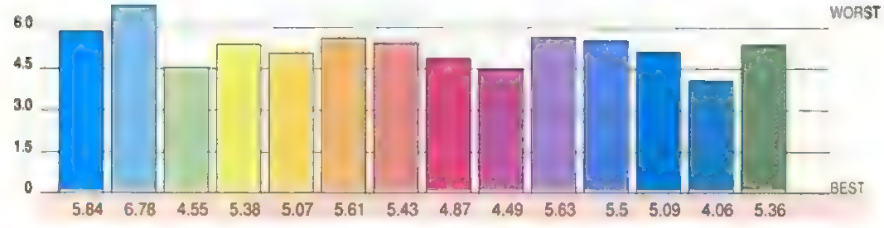
* Noncached systems.

DISK BENCHMARK TESTS

DOS File Access (Large Records)

Elapsed Time (seconds)

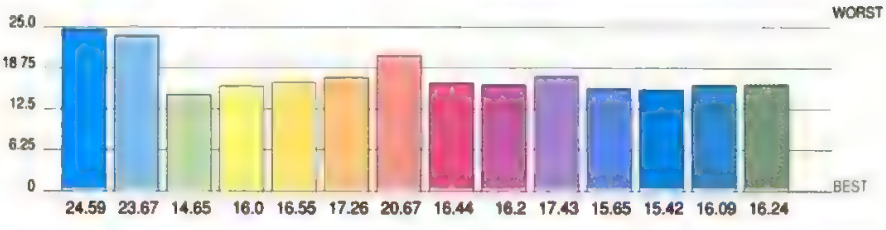
The **DOS File Access (Large Records)** benchmark test times disk throughput as a result of mechanical disk drive speed, hard disk controller function, and bus speed. This test minimizes the effect of small hardware caches on disk subsystem performance. It is performed without software disk caching. Fast times are advantageous when large files are loaded.



BIOS Disk Seek

Elapsed Time (milliseconds)

The **BIOS Disk Seek** benchmark test measures mechanical track-to-track disk drive access times. Fast times are helpful with programs such as databases, which often store and must later find data in many separate places on a drive.

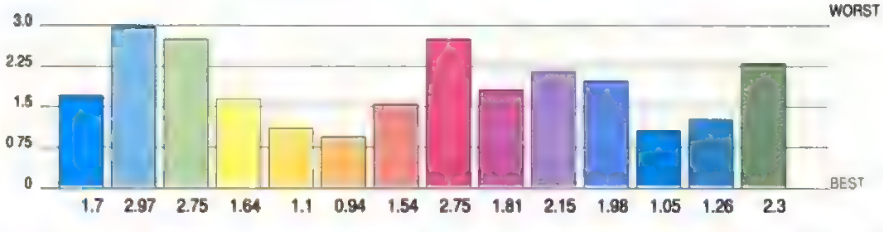


VIDEO BENCHMARK TESTS

Direct to Screen

Elapsed Time (seconds)

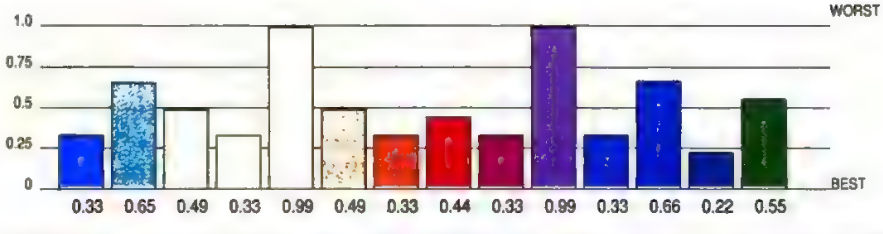
The **Direct to Screen** benchmark test indicates the speed of the video adapter memory. Good scores indicate that information can get to the screen quickly, particularly for programs that avoid the computer's BIOS and go directly to the screen.



Video BIOS Routine Without Scrolling

Elapsed Time (seconds)

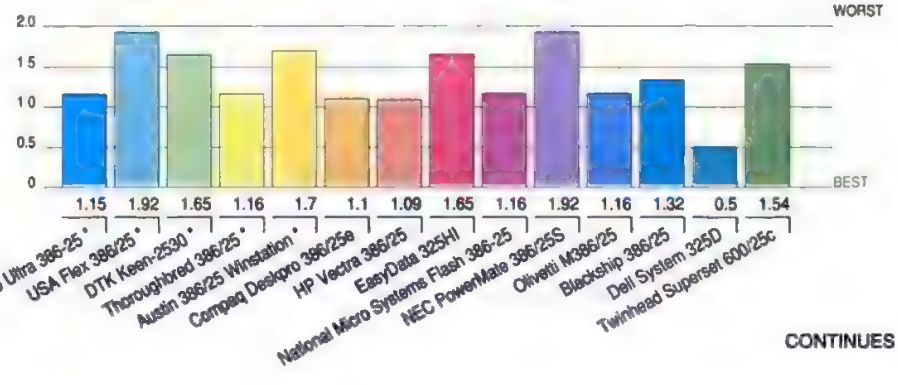
The **Video BIOS Routine Without Scrolling** benchmark test measures how quickly the BIOS on the video adapter writes text data to the screen. Fast video writing helps with programs that show full or partial screens of data without scrolling the screen.



Video BIOS Routine with Scrolling

Elapsed Time (seconds)

The **Video BIOS Routine with Scrolling** benchmark test measures how fast the video adapter can scroll the screen, moving the display up one line at a time. Good performance is helpful for scrolling through word processing or spreadsheet files.



* Noncached systems.

CONTINUES

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80MB	150MB	200MB

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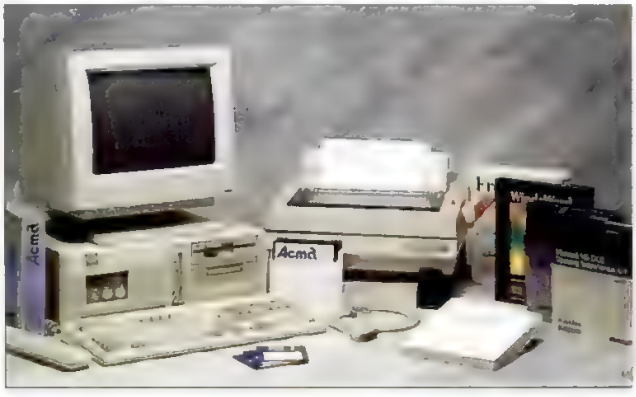
PC MAGAZINE "If you're looking to buy a computer by mail order but still want a company that will stand behind what is sells, the ACMA 386/25 is a good bet." "Among PCs reviewed this issue, our favorite is the ACMA 386/25." "Choose the ACMA 386/20 for better-than-average construction quality." (11/28 & 12/26 1989)

COMPUTER BUYERS GUIDE AND HANDBOOK "The Acma 386SX is highly expandable, performs well, and offers a very complete system for an excellent price...Acma offers one of the best service policies in the mail-order business." "The Acma system not only looks good, it's a good performer...it performed consistently above average." (May/June 1990)

COMPUTER SHOPPER "...the machine could reliably handle everything I piled onto it." "The systems from ACMA Computer, Inc. inspire confidence." "Clearly, ACMA intends to be competitive, not only in terms of system bang for the buck, but also in the realm of intangibles like technical support and product warranty. (April & July 1990)



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- 80486-25MHz CPU
- 4MB RAM
- 128K Cache
- 1.2MB 5.25" floppy drive
- 1.44MB 3.5" floppy drive
- 150MB ESDI hard drive
- 16-bit VGA card w/512K
- Super VGA color monitor (1024x768)
- 2 serial, 1 parallel & 1 game ports
- 101 Enhanced keyboard
- MS-DOS 3.3 or 4.01
- Two year warranty*

$4,595

386/25MHz Business System

- 80386-25MHz CPU
- 4MB RAM
- 64K Cache
- 1.2MB 5.25" floppy drive
- 1.44MB 3.5" floppy drive
- 100MB IDE hard drive
- 16-bit VGA card w/512K
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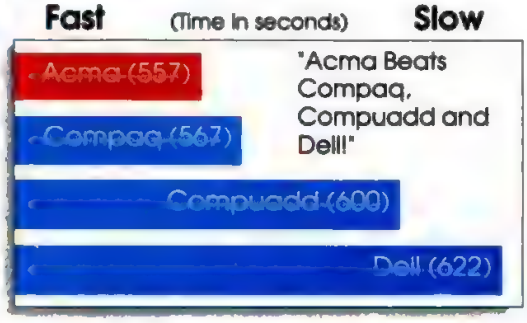

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CIRCLE 130 ON READER SERVICE CARD

GCH SYSTEMS INC.

EasyData 325HI

by Fredric Burke

In the never-ending search for machines that are simultaneously powerful and reasonably priced, GCH's EasyData 325 HI proves that the two are not mutually exclusive. In all but two benchmark tests—Direct to Screen and Video BIOS Routine with Scrolling—the EasyData excelled against stiff competition. In price, too, the $4,599 EasyData (with 4MB of system RAM, a 32K RAM cache, a 150MB hard disk, a single floppy disk drive, a 14-inch EasyData/Intra VGA monitor, and DOS 3.3 or 4.01) rates as an affordable machine, with a fair measure of technical sophistication to boot.

The $4,699 tested system included a 162MB hard disk and both a 1.2MB and a 1.44MB floppy disk drive. GCH itself builds this system's motherboard; in place of a traditional 386 chip set the company provides a discrete logic setup, backed up with AMI's increasingly popular BIOS. GCH also realizes the importance of speed in memory-intensive applications, and so features a fixed 32K Intel RAM cache, packaged in two 16K chips, each rated at 25 nanoseconds. The motherboard will also support both an 80387 and a Weitek 3167 math coprocessor simultaneously.

In its bid to keep the small-footprint 7-by 14.8- by 16-inch EasyData as compact as possible, GCH designed the motherboard to be free of system RAM. Instead, RAM is mounted on a 32-bit proprietary memory card included with the unit. The tested version of the machine came with 4MB standard; the card itself will handle up to 16MB of RAM in 1MB 80-ns. SIMMs. RAM upgrades to 8MB and 12MB are $560 and $840, respectively.

EXPANSION AT ISSUE

In small-footprint machines, expansion is an issue. While the EasyData does a creditable job, the physical limitations of the small footprint configuration come through. While the inclusion of a standard 32-bit memory card helps make the motherboard smaller, it also robs the EasyData of a slot, leaving the machine with five 16-bit and two 8-bit slots. Add to that an 8-bit I/O card, a superb 16-bit Genoa 5300 card

FACT FILE

EasyData 325HI GCH Systems Inc., 777 E. Middlefield Rd., Moutainview, CA 94043; (800) 366-4560.
List Price: With 4MB RAM, 32K RAM cache, 1.2MB floppy disk drive, monochrome display, one parallel and two serial ports, DOS 3.3 or 4.01, $3,409; with 150MB hard disk, VGA color display, $4,599; with 162MB hard disk, 1.2MB and 1.44MB floppy disk drives, $4,699.
In Short: The EasyData 325HI never dominated the computers on our tests, nor was it ever completely outclassed. At a fully configured price of $4,699, it embarrassed other machines costing much more.

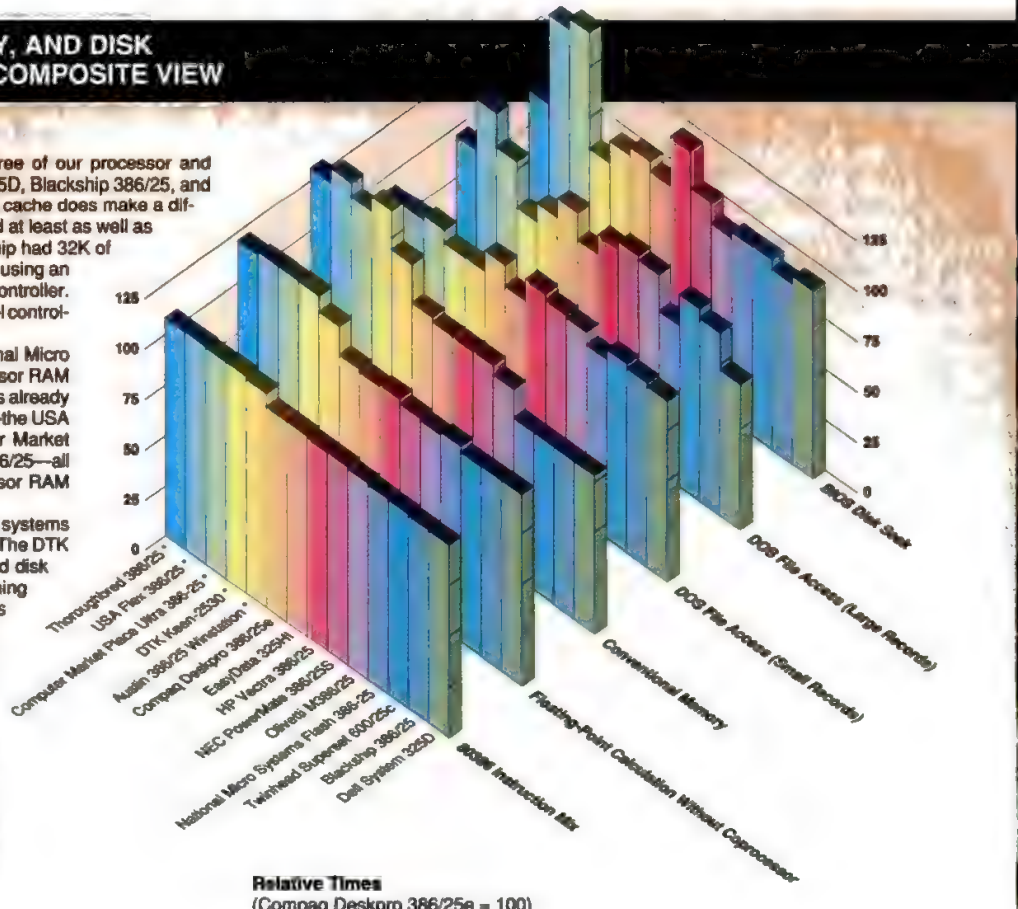
CIRCLE 550 ON READER SERVICE CARD

PROCESSOR, MEMORY, AND DISK BENCHMARK TESTS: COMPOSITE VIEW

Three machines placed at the top on all three of our processor and memory benchmark tests: the Dell System 325D, Blackship 386/25, and Twinhead Superset 600/25c. Processor RAM cache does make a difference, though machines with 32K performed at least as well as those with 64K. Both the Dell and the Blackship had 32K of cache on the motherboard, with the Blackship using an Intel controller and the Dell using an Austek controller. The Twinhead, which had 64K, also had an Intel controller installed.

On our Conventional Memory test, National Micro Systems' Flash 386-25, with its 64K of processor RAM cache, tied for first place with the three systems already mentioned. The four machines at the bottom—the USA Flex 386/25, the DTK Keen-2530, Computer Market Place's Ultra 386-25, and the Thoroughbred 386/25—all came with DTK motherboards but no processor RAM cache.

Maxtor drives showed up most often in the systems that garnered the best times on our disk tests. The DTK Keen-2530, with its 150MB Maxtor ESDI hard disk and Adaptec controller, performed best, finishing second on the small-record DOS File Access test, third on the large-record test, and first on the BIOS Disk Seek test. The 170MB Maxtor ESDI hard disk in National Micro Systems' Flash 386-25 also performed well, placing first and second, respectively, on the small- and large-record tests. Also worth mentioning is the Dell System 325D. With its 200MB Maxtor IDE drive, the system garnered a first-place time of 4.06 seconds on the large-record test. Three systems fell to or near the bottom of our disk tests: the HP Vectra 386/25, the USA Flex 386/25, and Computer Market Place's Ultra 386-25.



Relative Times
(Compaq Deskpro 386/25e = 100)

EasyData 325HI, $4,699.

with the Paradise chip set, and an UltraStor floppy/hard disk controller, and only three 16-bit slots and a single 8-bit slot remain for expansion.

EasyData has done a much better job catering to mass storage potential. The EasyData makes available three half-height bays and two internal 3.5-inch bays—one considered to be proprietary because of its position to the left of the horizontal drive bays—hung vertically like saddlebags from the half-height bays. The tested unit came with a Seagate 162MB ESDI hard disk, as well as the two YE Data floppy disk drives. Hard disk options range from a $299 40MB IDE to a $1,899 600MB ESDI drive. EasyData also makes available two internal tape drives: a 120MB device for $399, and a 500MB unit for $899. Phi Hong makes the 220-watt power supply, while Honeywell provides the keyboard.

EasyData lets the user specify either DOS 3.3 or 4.01 to accompany the bundled Quadtel expanded memory manager, handful of speedy utilities, disk caching and RAM disk software, and LIM EMS 4.0 drivers. The warranty on the EasyData makes it easy to live with: You get one year on parts and labor, plus on-site service from US Net. After a year, units must be shipped back to the factory for service.

The EasyData 325HI is a machine that will appeal to nearly everyone. Board expansion is limited, but even that does not detract from such a well-designed and competent system. If you're looking for a desktop system whose high performance belies its attractive price, the EasyData delivers.

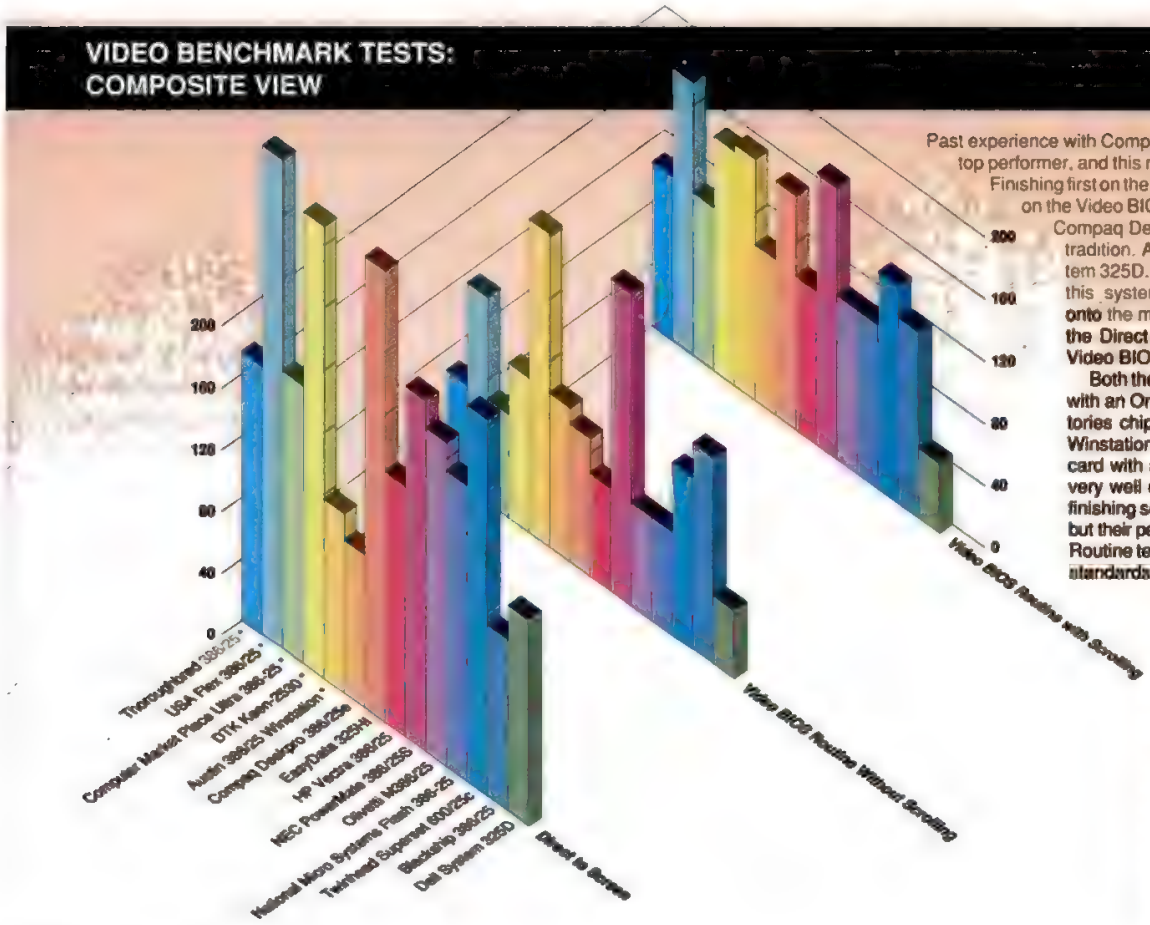
HEWLETT-PACKARD CO.
HP Vectra 386/25

by Fredric Burke

At $7,248 in *PC Magazine*'s standard configuration, Hewlett-Packard's Vectra 386/25 is expensive for the genre. What your dollars buy you is a system that combines decent performance and rugged construction with the confidence engendered by the all-important HP logo.

The tested system matched the standard configuration, and included 4MB of RAM, a 32K cache, a 168MB hard disk, a 1.2MB floppy disk drive, a VGA display

VIDEO BENCHMARK TESTS: COMPOSITE VIEW



Past experience with Compaq video has shown it to be a top performer, and this round of tests is no exception. Finishing first on the Direct to Screen test and third on the Video BIOS Routine with Scrolling, the Compaq Deskpro 386/25e continues the tradition. A worthy rival is the Dell System 325D. The Western Digital video on this system, which is also integrated onto the motherboard, placed fourth on the Direct to Screen and first on both Video BIOS Routine tests.

Both the Blackship 386/25 (equipped with an Orchid card and Tseng Laboratories chip set) and the Austin 386/25 Winstation (which had an Austin video card with a Tseng chip set) performed very well on the Direct to Screen test, finishing second and third, respectively, but their performance on the Video BIOS Routine tests did not live up to the same standards.

The NEC PowerMate 386/25S and USA Flex 386/25 did very poorly on our video benchmark tests. The NEC machine, using a Western Digital card with a Western Digital chip set, finished last on both Video BIOS Routine tests. The USA Flex unit, with an Ultimate card and Tseng chip set, tied the NEC for last on the Video BIOS Routine with Scrolling test and also placed last on the Direct to Screen test.

ENDS

* Noncached systems.

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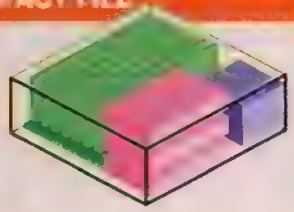


HP Vectra 386/25
Hewlett-Packard Co.,
19310 Prune Ridge Ave., Cupertino, CA 95014; (800) 752-0900.
List Price: With 2MB RAM, 32K processor RAM cache, 84MB hard disk, 1.2MB floppy disk drive, VGA color display subsystem, one parallel and one serial port, DOS 4.01, $5,699; with 4MB RAM, 168MB hard disk, $7,248.
In Short: Expensive and no speed demon, the HP Vectra 386/25 will appeal to those who look for ultimate reliability and ruggedness. Average performance ought to cost less.

CIRCLE 601 ON READER SERVICE CARD

subsystem, and DOS 4.01. Inside the 6.3- by 16.7- by 15.7-inch small-footprint machine is HP's own motherboard. Bus speed is switchable between 8 and 8.33 MHz. HP supplies its own BIOS, which can be shadowed only in its video mode, and Chips and Technologies provides the 386 chip set. Chips and Technologies also makes the fixed 32K RAM cache; it is packaged in two 16K SMT chips rated at 20 nanoseconds. A socket on the motherboard will support either an 80387 or a Weitek 3167.

RAM PACKED

Where HP has managed to distance itself from many of its rivals is in the amount of RAM that the motherboard will support; the base version comes standard with 2MB of 80-nanosecond RAM. Using 1MB SIMMs, you can get 8MB on the motherboard, but through the use of 4MB SIMMs, system RAM can hit a lofty 32MB. RAM is fairly expensive, though: A 2MB upgrade to 4MB goes for $599, and an upgrade to 8MB is $1,798. With system RAM concentrated on the motherboard, HP has no need to offer a proprietary memory add-in card for the Vectra.

By putting the hard disk and floppy controllers on the motherboard, HP has made the Vectra accessible to your slot expansion needs. Six 16-bit slots and a single 8-bit slot are present. With HP's very fast 16-bit video card—plugged into HP's very nice 14-inch D1182 VGA monitor—and 16-bit I/O card, there are still four 16-bit slots and the single 8-bit slot remaining.

While the machine tested came with a 1.2MB floppy disk drive, a 1.44MB floppy can also be specified, either in tandem or alone. HP also makes available 42MB, 84MB, 120MB, and 336MB hard disks. While most 25-MHz machines will not be called upon to perform the same tasks that their 33-MHz brethren will (as file servers or CAD terminals, for example), since drive bays are limited to space for only three half-height devices, care should be exercised when considering mass storage needs.

One place that the Vectra can stand improvement is in its choice of power supply. The HP-built unit puts out a measly 134 watts, with a 174-watt peak available for only a 10-second duration (useful when the PC is physically working harder—for example, when copying from drive to drive).

One thing that does not need help is HP's fine keyboard. Nor does HP skimp on software for the machine; the Vectra comes with HP's DOS 4.01, the HP DCache disk caching utilities, and HP EMM 386, an expanded memory manager. HP has also bundled a mouse with the machine. OS/2 is available for $369. Service includes one year parts and labor, plus a 90-day on-site HP service contract. When part of the appeal of this machine is the reputation of the company, the fact that you get only 90 days on-site service is somewhat disappointing.

Not one of the fire-breathers in this test, the HP's benchmark test scores were average compared with the other machines reviewed here, with fast video scores balancing out slow disk test scores. Overall, the HP Vectra 386/25 gives users average performance and expandability options at a much higher price. With the most basic machine selling at $5,699, HP is going to have to depend on its name more than the machine itself.

HP Vectra 386/25, $5,699.

NATIONAL MICRO SYSTEMS INC.

Flash 386-25

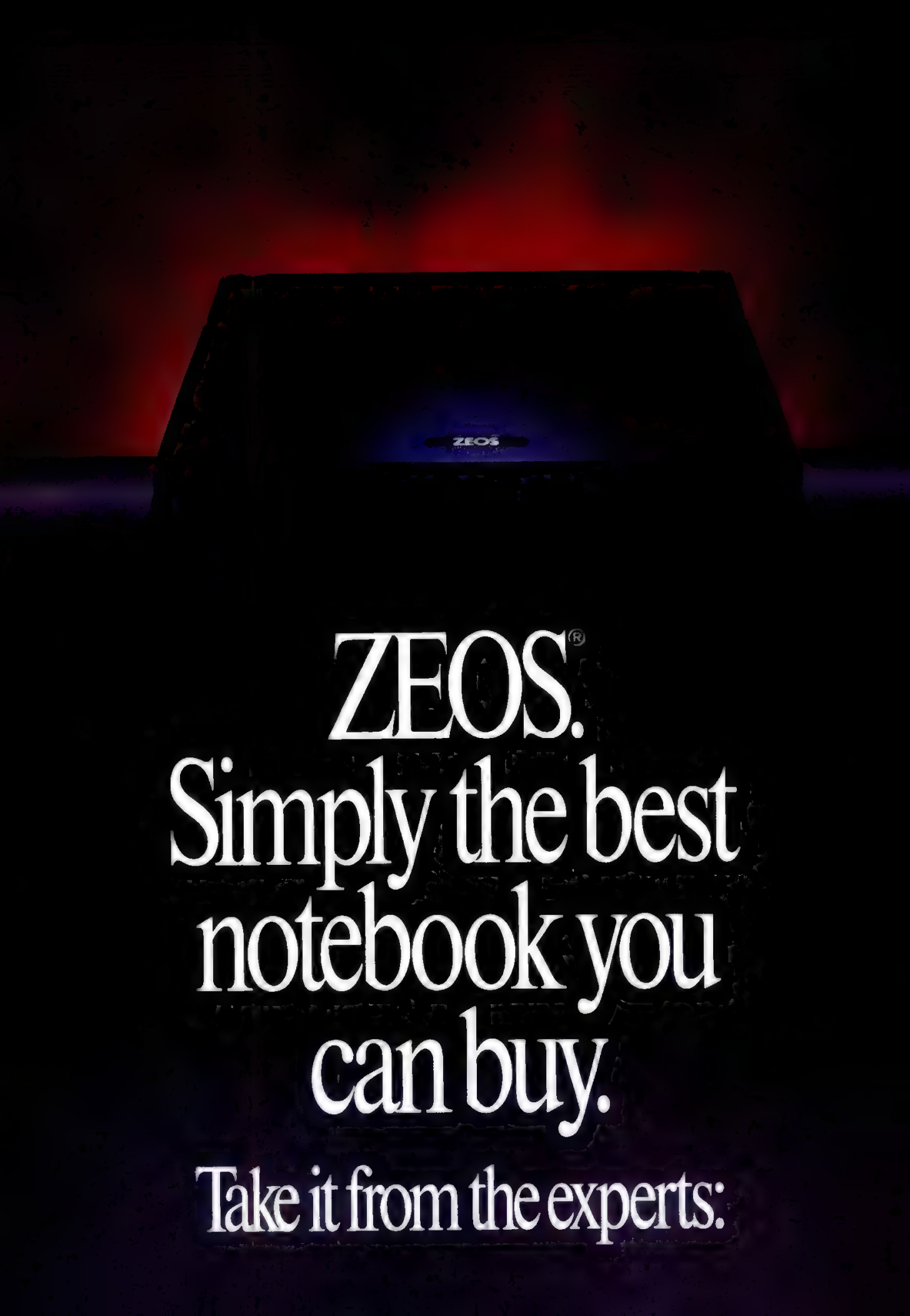
by Bill O'Brien

Calling your computer the Flash 386-25 is risky since it raises expectations. National Micro Systems took the chance and then made good on the promise by delivering a competitive performer at an extremely competitive $2,799. That's an amazing price for a computer with 4MB of memory, a RAM cache, a 170MB hard disk, and a top-of-the-line VGA display subsystem. What's even more remarkable is that the same system can be had with a 100MB hard disk for $300 less.

You might suspect that there would be a limit to the varieties of small-footprint enclosures possible, but the Flash 386-25 has an uncommon if not unique style that employs a saddlebag approach to maximize the bay count. The front panel cutouts permit direct access to four drives, divided up among three horizontal half-height and one 3.5-inch bay mounted vertically at the right side of the case. A look under the front panel reveals a second 3.5-inch bay immediately to the left of the half-height bays. The power switch is also mounted up front, and it turns on a 200-watt power supply.

National Micro Systems has opted for an AMI caching motherboard to fill the chassis. It's loaded with 64K of 25-nanosecond SRAMs in DIP configuration, the maximum processor RAM cache the system can hold. Coupled with the 4MB of 80-ns. system RAM, the Flash 386-25 made a good showing in PC Magazine Labs' processor and memory benchmark tests. Its performance ranks it solidly in the top tier.

The Flash 386-25 has an eight-slot motherboard, with one 32-bit slot used to expand the computer beyond the 8MB motherboard limit to the 16MB system maximum. Naturally, an AMI BIOS does housekeeping for the motherboard. There is a noticeable lack of large-scale integrated circuits; discrete components handle the 80386 chip set chores and manage the cache.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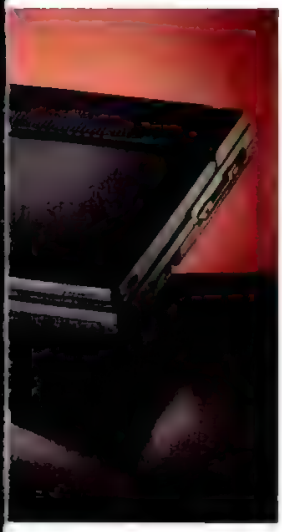

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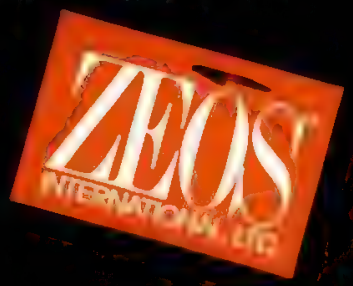

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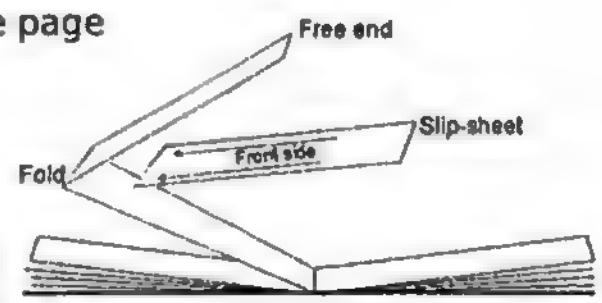

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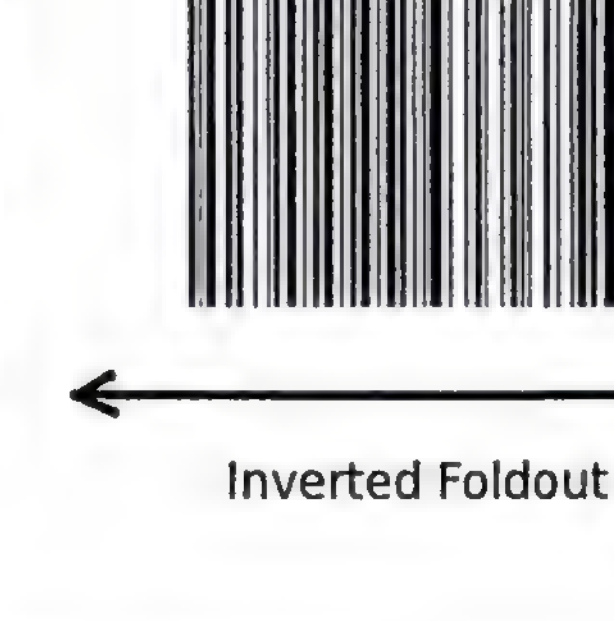

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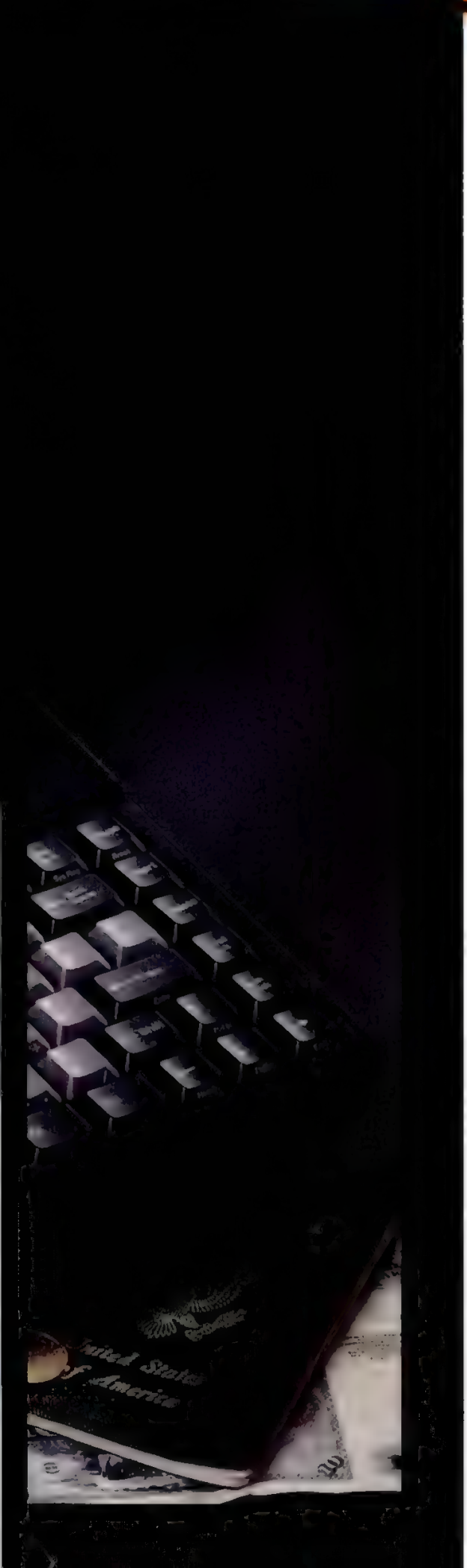
Back

1. Follow instructions on the other side



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But the features of your incredible new ZEOS Notebook don't just stop there. Detail after detail we're giving you more than anyone else. Much more, for much less. Take a closer look.

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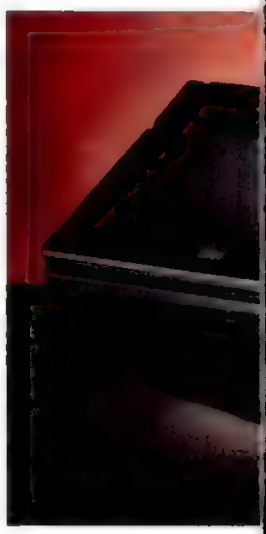

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10 Good Reasons To Buy From ZEOS®

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These are the attributes which *PC Magazine* used in awarding ZEOS the coveted Editor's Choice, not once but four times. And "Overall Excellence" are the very words *PC Magazine* used in describing ZEOS systems comparing them to all others.

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In one recent '386 review, *PC Magazine* awarded ZEOS Editor's Choice. "The ZEOS '386 blows away every other computer... a smart choice" is what they said. And in another recent review, *Government Computer News* said the ZEOS 33MHz '386 is "arguably the fastest MS-DOS and OS/2 micro in the world."

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AFTER

CIRCLE 131 ON READER SERVICE CARD

FACT FILE

Flash 386-25
National Micro Systems Inc., 2833 Peterson Pl., Norcross, GA 30071; (800) 642-7649, (404) 446-0520.
List Price: With 4MB RAM, 64K RAM cache, 100MB hard disk, 1.2MB floppy disk drive, Super VGA color display subsystem, one parallel and two serial ports, game port, DOS 4.01, $2,499; with 170MB hard disk, $2,799.
In Short: The price of the Flash 386-25 screams "Take me home!" and the Class B rating says that you may. The machine's performance falls in the upper half of the group.

CIRCLE **602** ON READER SERVICE CARD

FACT FILE

NEC PowerMate 386/25S
NEC Technologies Inc., 1414 Massachusetts Ave., Boxborough, MA 01719; (800) 632-4636, (508) 264-8000.
List Price: With 2MB RAM, 32K RAM cache, 1.2MB or 1.44MB floppy disk drive, VGA display, one parallel and one serial port, DOS 3.3, *Microsoft Windows* 3.0, $4,648; with 4MB RAM, 148MB hard disk, two serial ports, DOS 4.01, $7,177.
In Short: The NEC PowerMate 386/25S—an average performer—is sold only through dealers, but even with the anticipated heavy discounts it costs more than most of the machines we tested. The PC is well made and has a very short case, but you pay a price in limited room for drives and expansion cards.

CIRCLE **603** ON READER SERVICE CARD

HIGH-PERFORMING COMPONENTS

The Flash 386-25 we tested used a 170MB Maxtor ESDI hard disk attached to a Western Digital ESDI controller with a 32K buffer. PC Magazine Labs' large- and small-record DOS File Access benchmark tests firmly position the combo as runner-up in the race for data throughput. Because of its speed potential, an ESDI drive is typically an expensive option found in higher-priced computers. It's refreshing to see such a top-quality component in an economically priced PC.

While the Ahead Systems VGA board doesn't offer quite the same high performance as the Maxtor drive, the card is still fast enough to take a firm stand in the upper half of the group. If you ignore the results of PC Magazine Labs' Direct to Screen test with an eye toward alternative operating systems (for example, *Microsoft Windows* 3.0 and OS/2) where direct writes aren't allowed, the Ahead board lives up to its Wizard name. National Micro Systems joined it to a TVM 3A high resolution monitor and the appearance of the video, both in characters and graphics, is excellent.

While not user-surly, National Micro Systems' documentation—really AMI's motherboard documentation—is aimed specifically at the hardware-headed. Even so, the manual is surprisingly easy to read and informative without resorting to excessive technical jargon. Of course, because it is an AMI manual that discusses an AMI motherboard, it devotes an extraordinary amount of space to the CMOS setup and system diagnostics.

However clear the manual, National Micro Systems wants to see that you'll never need to refer to it. Technical support is a phone call away; if you need to swap parts, the company will accommodate you. You get a one-year warranty on parts and labor.

The quality of its components make the Flash 386-25 a shoo-in for almost any medium-level computer installation, including offices at home, thanks to its Class B rating.

National Micro Systems Flash 386-25, $2,799.

NEC TECHNOLOGIES INC.

NEC PowerMate 386/25S

by Bruce Brown

Looks count when it comes to NEC's PowerMate 386/25S. With average performance and a rather high price tag, there aren't many other compelling reasons to buy this computer.

Sold and supported only through authorized dealers and service centers, the $7,177 price for a system meeting *PC Magazine*'s standard configuration is costly, even taking into consideration the expected 25 to 35 percent discount. The price includes 4MB RAM, a 32K processor RAM cache, a 1.2MB floppy disk drive, a 148MB NEC 18-millisecond ESDI hard disk, an NEC MultiSync 2A Super VGA 14-inch monitor with a 0.31mm dot pitch, and interestingly enough (considering the vendor), a Western Digital/Paradise VGA board. Also included are one parallel and two serial ports, a 101-key keyboard, DOS 4.01, and *Microsoft Windows* 3.0.

The case is attractive and tidy, measuring only 5 by 17 by 16 inches. It includes PS/2-style keyboard and mouse ports on the front for added convenience. The power switch is also located on the front of the case. The machine doesn't provide a reset or turbo button, though, and a keyboard and case lock is an optional extra not included in the test machine.

NEC's motherboard runs at either 8 or 25 MHz, and *it* uses the Headland Technologies 386 chip set and Phoenix/NEC ROM BIOS, which includes password

NEC PowerMate 386/25S, $7,177.

protection in ROM and support for video and system BIOS shadowing. The motherboard accommodates either an Intel 80387 25-MHz or Weitek 3167 math coprocessor.

SNOOPING AROUND

All memory on the PowerMate is installed on a card that fits in its own 32-bit slot. The memory board uses memory interleaving to accommodate up to 16MB of RAM using 80-nanosecond SIMM modules available in several different combinations of 256K and 1MB units.

The processor RAM cache is controlled by an Intel 82385 chip and uses 25-ns. SRAM chips. The cache circuitry includes cache "snooping" to help insure cache coherency; in other words, if something that is already in the cache memory is changed in regular RAM, the cache gets immediately updated as well. Cache coherency is a significant issue and NEC's inclusion of this technology is a big plus.

There are a total of six slots on the system: the single 32-bit slot and five 16-bit slots (three available with the video board and ESDI drive controller installed). Not surprisngly, the PowerMate's low case has space for only three drives: two 5.25-inch half-heights and one 3.5-inch device. The 110-watt power supply with three device leads is ample for the relatively limited drive and interface card expansion.

The PowerMate's benchmark test scores were acceptable, but only marginally so when considering the price of this machine. The processor and memory scores were average, but all disk and video scores fell in the bottom half of the range. With fairly narrow performance ranges like these, the occasional low score isn't much of a concern. However, when you start to get a lot of low numbers, you can't help but wonder if you're not getting all the performance you might want, especially for the list price.

Note, however, that NEC's authorized dealers sometimes equip the systems with non-NEC components to get the prices down. Most service and support is via your dealer, although there are twelve NEC walk-in service centers across the country. The standard warranty is for one year and covers parts and labor.

The NEC PowerMate 386/25S is a small, good-looking machine that can work well for someone who doesn't need many drives, uses only a few expansion cards, and doesn't mind the high price. Unfortunately, even for those users, its average to low performance and largely dealer-based service keep it from being very competitive in this hotly marketed class of computers.

OLIVETTI OFFICE USA
Olivetti M386/25

by Bill O'Brien

Although the $8,865 price of the Olivetti M386/25 (with 4MB of RAM, a 32K RAM cache, a 200MB hard disk, a 1.44MB floppy disk drive, and a VGA display subsystem) exceeds that of many of the reviewed machines, solid performance and intelligent design have always come at a price.

Olivetti offers one of the cleverer small-footprint designs we've seen.

Olivetti offers one of the cleverer small-footprint designs we've seen. The drive bay arrangement is ingenious. On the face of things, the M386/25 offers space for up to four 3.5-inch devices, all of them with potential front-panel access. But Olivetti hasn't ignored the fact that in the real world many storage devices come in a half-height form. While there is a physical divider demarcating the upper two bays, the lower two bays are a single open expanse that will fit either two 3.5-inch devices or one half-height drive. Granted, installing a half-height drive will destroy the aesthetics of the case, but it's nice to know the possibility is there.

Few motherboards are actually designed to fit in a small footprint enclosure and still allow access to all of the possible sockets, jumpers, and switches you might need to reach. Usually, when it's time to add a coprocessor or change the memory configuration, you'll need to remove the hard disk, power supply, or motherboard itself to do the work. This is partially true for the M386/25, but the important difference is that you won't need any tools to extract the obstacles. Olivetti has placed all four drive bays and the power supply on a removable subchassis; one push on a tab at the front of the main chassis releases the subassembly, which then hinges back and up for removal. The power and data cables are all long enough to permit the subsystem to be moved to the side without your needing to disconnect anything. Bravo!

The front panel controls are fairly standard, with buttons or switches for turbo mode, reset, and power. The only point of design contention is the power switch; Olivetti uses the switch to push a rod that pushes the actual switch located back inside the machine on the power supply. It works, but most other vendors have decided to rewire the supply and bring the switch to the front of the machine without resorting to rods. Olivetti should have made this move, too, as it avoids the potential problem of the rod's bending or breaking.

THE NAME IS THE GAME

The motherboard is an exercise in the printing of a single name: Olivetti. The company claims the board as its own, and the Olivetti logo marks almost all of the large scale integrated circuits. The notable exception is the Intel 82385 cache controller that manages the 32K of 25-nanosecond SRAMs. Olivetti gets credit as the system BIOS manufacturer.

Olivetti claims a total motherboard expansion possibility of 10MB. The system can be stretched out to 18MB with the use of a plug-in RAM expansion board. PC Magazine Labs' processor and mem-

FACT FILE

Olivetti M386/25
Olivetti Office USA, 765 U.S. Highway 202, Somerville, NJ 08876; (201) 526-8200.
List Price: With 2MB RAM, 100MB hard disk, 1.44MB floppy disk drive, VGA monochrome display subsystem, one parallel and one serial port, DOS 4.01, $6,740; with 4MB RAM, 200MB hard disk, VGA color display subsystem, one parallel and two serial ports, $8,865.
In Short: Higher-than-average pricing may not make Olivetti the computer for everyone, but it's a serious contender if you need the corporate touch.

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WordStar 6.0 vs. WordPerfect 5.1

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WordStar 6.0 vs. WordPerfect 5.1

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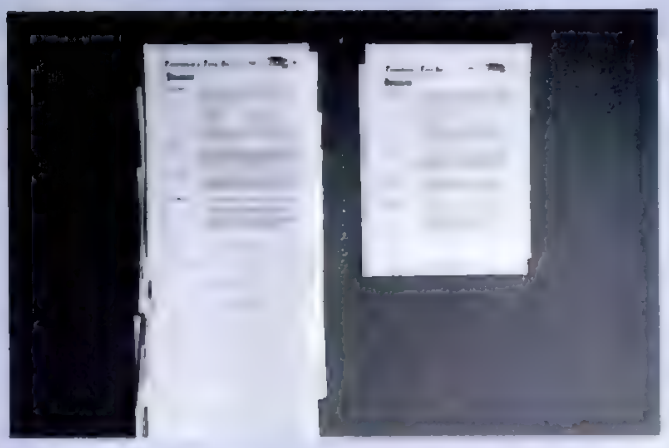

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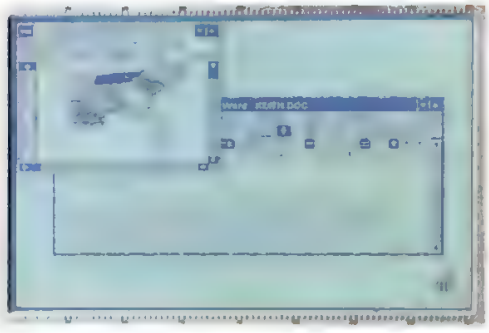

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CIRCLE 736 ON READER SERVICE CARD

Olivetti M386/25, $8,865.

ory benchmark tests show that both the cache and system RAM have been put to good use; the M386/25 ranks in the top tier of reviewed machines. Both Weitek and Intel math coprocessors are supported for additional numeric processing speed.

The M386/25 has five 16-bit slots. However, the hard disk has an embedded controller, and the floppy controller, video, and I/O ports originate on the motherboard, so all five slots are free.

Olivetti's choice of a Conner hard disk and controller with a 32K buffer gives the unit midrange disk performance in PC Magazine Labs' buffer-busting large- and small-record DOS File Access tests. Its proprietary 1,024-by-768 video system proved above average in the video tests we put it through.

The unit comes with a standard one-year parts and labor warranty, with the added extra of on-site service provided by Olivetti or the authorized dealer from whom you purchase the unit. The Class B rating won't necessarily put the pricey M386/25 in your home, but the service assurance paves the way for the machine to become an effective office tool.

THOROUGHBRED MICROSYSTEMS INC.

Thoroughbred 386/25

by Bill O'Brien

What else would you call a computer from a company in Kentucky but Thoroughbred? This 25-MHz 80386 may be more a quarter horse than a racer. Its $3,095 price for the standard configuration of 4MB of RAM, a 200MB hard disk, two floppy disk drives, and a VGA display subsystem is a few lengths ahead of the field compared with some other noncaching computers, but that price includes delivery to your door anywhere in the continental United States, as well as a few extras.

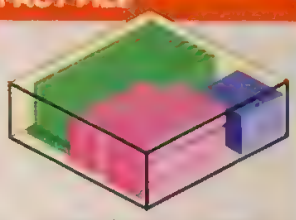
The look of the Thoroughbred 386/25 should be familiar to you. It's the same small-footprint enclosure used by several other machines in this review. Front-panel controls include reset and turbo buttons with their corresponding LEDs. Five drive bays offer front access, with the drives positioned to their best effect. A 1.2MB floppy disk drive occupies one of the three horizontal half-height bays and a hard disk sits in a second. One of the two vertical 3.5-inch bays holds the 1.44MB drive; the second is available for future expansion.

The Thoroughbred 386/25 may be more a quarter horse than a racer.

Thoroughbred has also selected a DTK motherboard and opted for DTK's BIOS. Discrete logic is used in place of a large-scale integrated 80386 chip set. Four SIP sockets provide space on the motherboard for 8MB of memory; an additional 8MB can be added through an optional proprietary 32-bit memory board. Both Intel 80387 and Weitek 3167 coprocessors are supported.

While the Thoroughbred manages to remain competitive with other noncaching computers, it shows no spectacular processor or memory performance when run through PC Magazine Labs' 80386 Instruction Mix, Floating-Point Calculation, and Conventional Memory tests. System BIOS shadowing is enabled via software and not through the CMOS setup, so any gains available from shadowing are not reflected in the test results. The Conner 200MB hard disk that does storage duty in the Thoroughbred proved quite competent, although its 32K buffered controller was overwhelmed by PC Magazine Labs' large- and small-record DOS File Access tests.

FACT FILE



Thoroughbred 386/25
Thoroughbred Micro-Systems Inc., 616 Bark Cove Dr., Owensboro, KY 42303; (502) 683-5301.
List Price: With 4MB RAM, 100MB hard disk, 1.2MB and 1.44MB floppy disk drives, Super VGA color display subsystem, one parallel and two serial ports, DOS 4.01, $2,795; with 200MB hard disk, $3,095; with 64K RAM cache, $3,294.
In Short: The Thoroughbred 386/25 has a price that is hard to ignore, and its performance is quite competitive with the other noncaching machines. Note that the list price includes delivery within the continental United States.

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WINNING VIDEO PERFORMANCE

Video is the most prominent feature of the machine. The card of choice is an Orchid ProDesigner II, which is a solid and very fast performer. PC Magazine Labs' video tests bear out that statement, as the fine results were achieved without the benefit of video BIOS shadowing (also enabled via software and not through the CMOS setup). Harnessed to a 1,024-by-768 multiscanning monitor, the visual acumen of the ProDesigner II came through like a winner.

Thoroughbred 386/25, $3,095.

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GLOWING REVIEWS *PC Magazine* said it best in giving Fastback Plus its prestigious 1989 Editor's Choice Award: "Fastback Plus has virtually everything a backup program needs: top-speed performance, clear menus, every imaginable option, even a built-in macro program for automating complex tasks. A superb achievement."

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USA FLEX

Flex 386/25

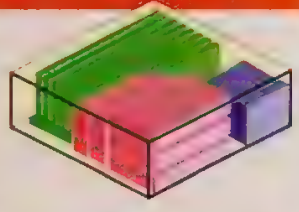
by Bill O'Brien

There's room for performance improvement in USA Flex's 386/25, but the machine's low $2,790 sticker price may be the only benefit that's really of any importance to you. That price includes 4MB of 80-nanosecond system RAM, a 200MB IDE hard disk, both 3.5-inch and 5.25-inch floppy disk drives, a VGA display subsystem, DOS 4.01, and *Microsoft Windows* 3.0.

The case of the Flex 386/25 is a sculptured small-footprint design that we saw quite a few times in the course of this roundup of 80386 machines. The front-mounted reset switch and keyboard lock complement the two accessible half-height drive bays that were filled with both 1.2MB and 1.44MB floppy disk drives. Normally, there would be two vertically oriented 3.5-inch bays accessible to the front panel, but USA Flex has chosen to install the hard disk in that space and leave the third half-height bay free. Even though the drive is a 3.5-inch device, its mounting base gives it sufficient size to block both of the 3.5-inch bays. It's a strange arrangement considering the limited real estate inside a small-footprint case.

No concessions to the machine's small size were made in the choice of a power supply. With five possible devices to power as well as I/O boards and memory, USA Flex had the foresight to include a 200-watt unit.

FACT FILE



Flex 386/25
USA Flex, 135 N. Brandon Dr., Glendale Heights, IL 60139; (708) 351-7334.
List Price: With 1MB RAM, 71MB hard disk, 1.2MB floppy disk drive, 512K Super VGA color display subsystem, one parallel and two serial ports, DOS 4.01, *Microsoft Windows* 3.0, $2,195; with 4MB RAM, 100MB hard disk, 1.2MB and 1.44MB floppy disk drives, $2,590; with 200MB hard disk, $2,790.
In Short: The Flex 386/25 won't win any awards for its speed of execution, especially as it lacks caching. Pricewise, however, the 4MB system with a 100MB hard disk and a Class B rating is nearly unbeatable.

CIRCLE 607 ON READER SERVICE CARD

STEADY, NOT SCREAMING PERFORMANCE

The motherboard is from DTK and uses discrete logic in place of a large-scale integrated 80386 chip set. A Phoenix BIOS maintains law and order.

Four SIP sockets provide room for motherboard memory. The system is capable of supporting 8MB of RAM on the motherboard using 1- by 36-megabit SIPs, with an additional 8MB of expansion possible through an optional proprietary memory board that can be used in the system's 32-bit slot. This arrangement is certainly no performance screamer, but the USA Flex system we tested (with a 100MB hard disk) managed to hold its own against the other noncaching machines in this review when run through PC Magazine Labs' 80386 Instruction Mix, Floating-Point Calculation, and Conventional Memory benchmark tests.

Service and support are solid components of the Flex 386/25. The PC is warranted for a year, and USA Flex will diagnose problems over the phone and ship replacement parts.

System BIOS shadowing is enabled via software, not through the CMOS setup, so the tests do not reflect possible performance gains achieved through shadowing.

The hard disk and video card offer little relief from the Flex 386/25's moderate levels of performance. Neither subsystem falls markedly below the level of its peers in this review, but neither proves outstanding. Here, too, enabling video BIOS shadowing through the included utility disk should eke out some better results than indicated by our video benchmark tests. There are absolutely no complaints with the appearance of the video, though; characters are well defined and colors are vibrant.

USA Flex 386/25, $2,590.

PATCHWORK DOCUMENTATION

There's no joy in Mudville over the Flex 386/25's documentation. To be fair, there is some attempt to provide usable information, but the patchwork wears thin among the incorrect diagrams, the poor quality of many of the illustrations, and the two or three drawings of the Flex 386/25 that fail to reflect the current appearance of the system. USA Flex is not alone in this; its documentation is typical and indicative of the corner-cutting vendors do to maintain low price profiles.

Service and support, on the other hand, are solid components of the Flex 386/25. The PC is warranted for a year on all parts and labor; the company will diagnose problems over the phone and ship parts to replace defective items. If for any reason the problem proves insoluble using these methods, USA Flex will dispatch a third-party service person to handle the matter on-site (third-party service providers vary according to your location). That's a top-drawer option.

The Flex 386/25 is certainly not a power user's dream system, but its FCC Class B rating, its low retail price, and USA Flex's support options make it acceptable for users trying to fit a home machine into their budget. ■

Bruce Brown *and* **Fredric Burke** *are frequent contributors to* PC Magazine. **Bill O'Brien** *is a contributing editor of* PC Magazine.

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PC MAGAZINE

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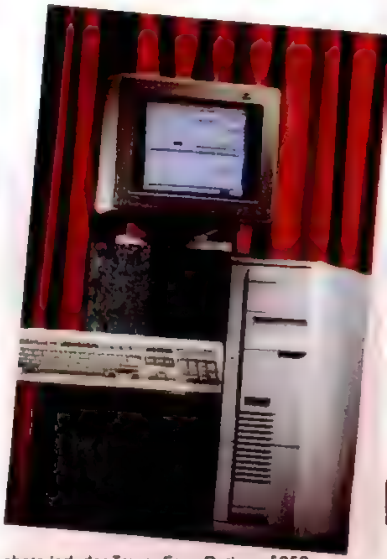

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dBASE IV, Version 1.1

A New Beginning

The long-awaited upgrade to Ashton-Tate's flagship product has been battling capable competition like *FoxPro* and *Paradox* for six months. Does it have the features to hold its own?

by Richard Hale Shaw

Last July, after nearly two years of delays and false starts, Ashton-Tate finally released *dBASE IV,* Version 1.1, the widely anticipated upgrade to Version 1.0. For Ashton-Tate, releasing Version 1.1 had become a matter of honor: The original *dBASE IV* was virtually unusable, so Version 1.1 had to be a bug-free, stable package as well as a solution to the problems introduced by the new features in Version 1.0. Nearly three and a half years had passed since the release of *dBASE III Plus,* and other database vendors were not sitting idly.

Fortunately, *dBASE IV,* Version 1.1, is a far more useful product than *dBASE III Plus,* and a stable, reliable replacement for Version 1.0. But the PC database world has changed remarkably, and Version 1.1 must compete with Fox Software's *FoxPro,* Version 1.02, Borland's *Paradox,* Version 3.5, and new products from

ILLUSTRATION: DAVE FOSTER/LOGO IS A REGISTERED TRADEMARK OF ASHTON-TATE CORPORATION

Nantucket and Microrim. What do these products offer that *dBASE IV* does not? What features are present in *dBASE IV* 1.1 that improve on those found in Version 1.0 and *dBASE* III Plus? And how does *dBASE IV* measure up to them all?

A LOOK BACK

As we said when we first looked at *dBASE IV*, "The wait has been long and tiresome, but the finished product represents nothing less than a complete overhaul of this immensely popular package." (First Looks, *PC Magazine*, January 17, 1989.)

A complete overhaul it was. Other than the underlying language and file structures, little remained of *dBASE III Plus*. To begin with, the Assistant, a menu-driven interface, had been replaced with the Control Center. The Control Center lets you display and manipulate almost any type of database object: files, views, forms, reports, labels, and even programs. The Control Center's purpose was to eliminate reliance on the *dBASE* dot-prompt, which developers loved and end-users hated. The Control Center offered facilities to simplify *dBASE* file management for end users. It included a DOS shell that was as good as any on the market at the time. Ashton-Tate hoped that developers might come to rely on the Control Center as a front end for their applications.

The Control Center wasn't the only interface enhancement. *dBASE IV* 1.0 boasted a true Label and Report Generator, with WYSIWYG interfaces for designing reports exactly as they appear, calculated fields, summaries, boxes, lines and printer font support. In addition, Version 1.0 offered a Query-By-Example (QBE) facility. This allowed users to search for records by checking off the fields they wished to see, establishing selection conditions with simple expressions and formulas, and retrieving the corresponding rows—all with a few keystrokes. While *dBASE IV* wasn't the only PC DBMS with QBE—*Paradox* has had QBE since the mid-1980s—it was an innovative alternative to using the SEEK, FIND or LOCATE commands.

For developers, Version 1.0 offered a nearly complete implementation of SQL like that found under *DB2*, IBM's relational database manager for mainframes. Unfortunately, the SQL module in that version proved to be completely unusable. But Version 1.0 also offered a template language that developers could use to generate programs, labels, reports and screen forms. Windowing facilities with both horizontal and pop-up menus were introduced with Version 1.0, as were User Defined Functions (UDFs). Again, UDFs weren't that innovative for database mavens—*FoxBase* already had them—but they let you create your own functions and extensions to the *dBASE* language.

> The Control Center lets you manipulate almost any type of database object: files, views, forms, reports, labels, and programs.

dBASE IV 1.0 also offered two-dimensional arrays, as well as commands to copy records to arrays and generate new records from them. Other features included automatic multiuser facilities with record and file locking, and auto-retry. Version 1.0 even offered auto-refresh, the ability to provide real-time screen updates when one user modifies a record displayed by another user. This was an important addition to *dBASE* because it had been available in *Paradox* two years prior. In addition, an Applications Generator, a tokening compiler, and expanded support for procedures were available to aid *dBASE*-language developers.

More unusual, then and today, is *dBASE IV*'s printer support. Version 1.0 offered the ability to support up to four printers at one time, with five fonts supported per printer driver, and the ability to switch between drivers without reinstalling the product. Further, Version 1.0 introduced multiple indexes: a single disk file, maintaining up to 47 separate index keys, could be opened automatically when its corresponding database file was opened. For *dBASE* users and developers, this meant that a single USE command could open a database file and its multiple index (.MDX) file, and that all 47 keys were maintained as changes were made to the database file. These features, transaction processing, and a host of new commands and functions such as SCAN, LOOKUP, and CALCULATE showed that *dBASE IV* was a major advance for *dBASE* users.

Yet, as *PC Magazine* said at that time, "*dBASE IV* features that will seem revolutionary to seasoned *dBASE* users are mere copies of those offered by competitive products." In addition, Version 1.0 was riddled with bugs. Its memory requirements prevented it from running even the most modest applications, and something as simple as a Ctrl-Break could bring it crashing to a halt.

Thus, legions of *dBASE*-language database developers turned their attention to *FoxBase* and *Clipper*, and end users and other database developers looked to *Paradox*. For nearly two years, these competitors made major inroads to the PC database marketplace, mostly at Ashton-Tate's expense. With *FoxBase* (now *FoxPro*) and *Paradox*, Fox Software and Borland nearly doubled their market share.

FACT FILE

***dBASE IV*, Version 1.1**
Ashton-Tate, 20101 Hamilton Ave., Torrance, CA 90509; (213) 329-9989.
List Price: Standard Edition, $795; Developer's Edition, $1,295; LAN Pack for five users, $995.
Requires: 640K RAM with 450K available at runtime, hard disk with at least 3.5MB free, DOS 2.1 or later.
In Short: Version 1.1 of *dBASE IV* is a vast improvement over the unsuccessful Version 1.0. The Control Center and QBE features work better, but the SQL interface could be integrated more thoroughly. An integrated disk cache utility is meant to improve performance, and it does to an extent, but *FoxPro* is much faster.

CIRCLE 407 ON READER SERVICE CARD

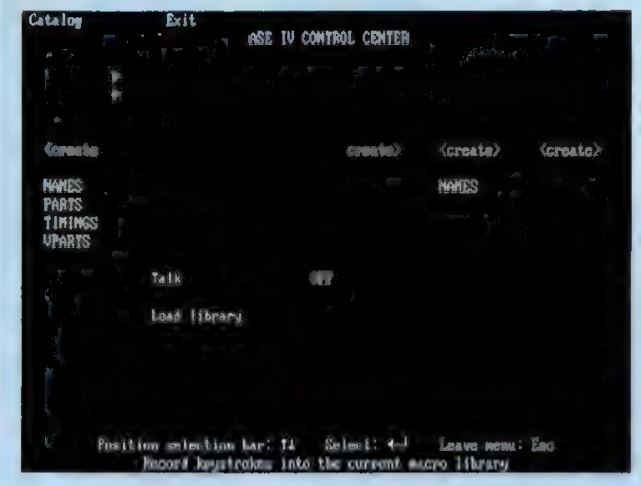
WHAT'S NEW?

How well does *dBASE IV*, Version 1.1 make up for lost time? Nearly all the components introduced in Version 1.1 work the way they should have in Version 1.0. In many cases, Version 1.0 features have been expanded or improved, and a number of new features have been added. The installation program has been improved and the bugs are gone (it was easy to confuse or crash). There are now options for a quick or full installation, as well as a menu-driven, selective installa-

tion of each program feature. It's easy to install the minimum configuration, or almost any combination of *dBASE IV* features.

The Control Center has been improved as well. The various menus are more accessible, and you can switch easily from one module to another. For instance, the Organize menu, which is used to create and drop indexes, delete records, and pack a database, is available from the other components like BROWSE, EDIT, and QBE. You don't have to get it via the Control Center main menu.

If you use the Control Center for a while and then spend time with the *Paradox* and *FoxPro* user interfaces, you'll wonder why Ashton-Tate didn't completely revamp it. Comparatively speaking, it is unwieldy and unproductive. It uses separate screens for each module, so you cannot move from one module to another without completely changing the display. This tends to stifle the usefulness of modules like QBE, since you cannot view other tables while you fill out a QBE form. At least the *Paradox* QBE lets you view and edit tables while building a query. *dBASE* and *Paradox* lack what *FoxPro* offers: a mouse-compatible, windowing interface.



Instead of the traditional "dot-prompt," *dBASE IV*'s new Control Center now occupies center stage. You can create and manipulate files, queries, reports, forms, labels, and applications from it.

QBE

Many other features have undergone changes and improvements as well. For instance, where Version 1.0's QBE had fixed fields that were 21 characters wide, Version 1.1 offers variable-width fields that are initially the width of the field name. Version 1.1 also lets you utilize UDFs in the QBE form.

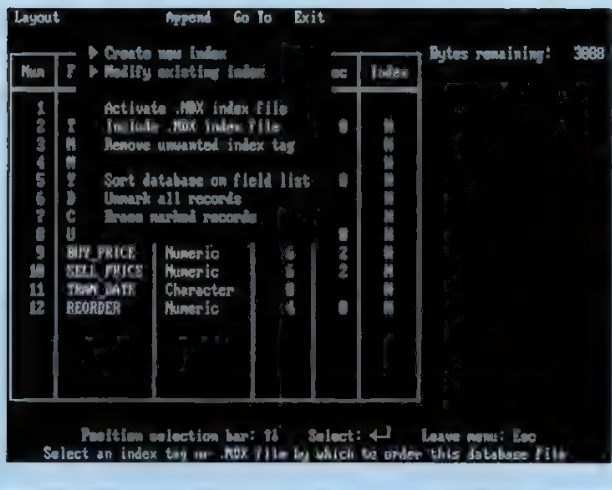
dBASE IV's QBE is an integrated part of the Control Center, so it's easy to switch between tasks such as creating queries and generating reports. Version 1.1's QBE is robust, offering multitable joins, the ability to perform calculations, groupings, summaries and sorts, and the ability to execute partial and approximate searches. You can use alias names for output fields, and reuse queries from the inside of an application.

Unfortunately, the Control Center interface tends to strangle QBE, as well as some other modules. The Control Center uses separate screens to manage each module, so you can't move from one module to another without completely changing the display. Thus, where the *Paradox* QBE lets you view tables while building a query, you can't keep the *dBASE IV* QBE form on the display when you move to other modules, such as the Organize menu (for file management) or the table BROWSE or EDIT facilities.

Even the QBE interface isn't as simple as it could be. While you can add selection conditions via a "condition box," it would have been easier to enter the conditions in the affected columns.

The *dBASE* and *Paradox* QBE implementations differ in other ways. For instance, when you generate a query with *Paradox*, it will reevaluate the state of the tables being used, the indexes available, and the selection criteria specified in the query. This is called "dynamic query optimization," and it allows *Paradox* to determine the fastest path to the requested records. This path can change a great deal, especially on a multiuser system. On the other hand, *dBASE IV*'s QBE generates a *dBASE* program when you save a query, and it is run whenever you execute the query, making considerable use of the SET FILTER TO and SET RELATION TO commands. These commands establish the conditions by which a set of rows are retrieved and the way the tables are linked. While generating a *dBASE* program is a convenient way to implement QBE, it doesn't allow for any optimization since the directions for retrieving the records are the same every time.

Because it's using SET FILTER and SET RELATION, *dBASE IV* simply creates a view of the requested records and lets you display the results from the Control Center using BROWSE or EDIT. (You can optionally place the results in a new table.) Unfortunately, when you BROWSE the results of a QBE query against multiple tables, they are shown in a read-only display. And to accommodate the search for requested rows, *dBASE IV* requires indexing on the search key field(s). If such an index exists, *dBASE*



New to *dBASE IV*, Version 1.1, is the ability to create and manipulate indexes and file structures from the Control Center's File Menu.

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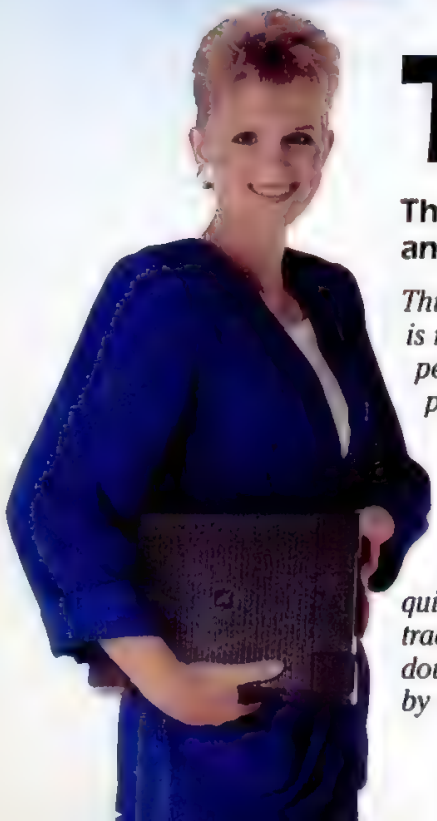

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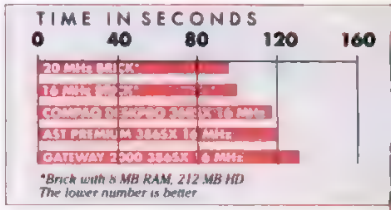

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— PC MAGAZINE, Sept. 1990

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aggregate of system, video and hard disk benchmarks.

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will use it. If not, it will build a new index from scratch when you save the query. This not only consumes disk space, it takes a lot of time, especially for infrequently executed, ad hoc queries.

By contrast, *Paradox* doesn't require an index. Dynamic query optimization takes advantage of existing indexes or goes on without them. It puts the results in a new ANSWER table. The advantage is that you can browse and edit this table directly, as well as update the original table from it. The disadvantage with *Paradox*'s approach is that you're constantly rebuilding the ANSWER table, which takes time and disk space. It's usually faster for a user to scroll through such a table or for an application to process it.

dBASE IV's Query-By-Example facility makes it easy to switch between tasks such as creating queries and generating reports.

While *dBASE* advocates might claim that *Paradox*'s ANSWER table is only a snapshot of the requested rows—they may be changed by another user while you work with the ANSWER table copy—*Paradox*'s queries run fast enough to be regenerated (see the Search test in the performance tests). *Paradox* will restart a query if the underlying data changes during query execution.

OTHER NEW FEATURES

Developers will find that *dBASE IV*, Version 1.1, offers a welcome number of new commands and functions, in addition to improved support for UDFs. For instance, a new FOR statement can be used when creating an index. It establishes a condition, and only records that meet the condition are included in the new index. Thus, you can create conditional indexes that contain only a subset of a table's records. A KEYBOARD command lets you insert ASCII characters into *dBASE IV*'s type-ahead buffer. The new REPLACE FROM ARRAY command lets

dBASE IV (AND SELECTED COMPETITORS): SUMMARY OF FEATURES

Products listed in alphabetical order

	dBASE IV, Version 1.1	FoxPro, Version 1.02	Paradox, Version 3.5
List price	$795	$795	$795
PERFORMANCE FEATURES			
Disk cache utility included	■	■	■
Integrated expanded memory support	❑	■	■
Integrated extended memory support	❑	❑	■
Protected-mode support	❑	❑	■
Interface	Pull-down menus	Pull-down menus	*Lotus 1-2-3*–style menu bar
Supports mouse	❑	■	❑
PRINTER SUPPORT			
Number of printer drivers included	80	None	23
Printer drivers changeable within program	■	N/A	■
Supports laser printers	■	❑	■
Supports PostScript	■	❑	❑
Installable font support	■	❑	❑
FILE LIMITS/MANIPULATION			
Maximum record or row size	4K	4K	4K
Maximum number of columns or fields per row or record	255	255	255
Maximum number of rows per file or table	1 billion	1 billion	2 billion
Maximum number of open tables	10	25	20
Maximum number of open files	99	99	99
INDEXING			
Maximum number of indexes used simultaneously	470	25	255
Compound indexes	■	❑	❑
Conditional indexes	■	❑	❑
Unique index creation	■	■	■
Automatically maintains indexes	■	■	■
Index need not include first field	■	■	■
Optional indexing of first field	■	■	■
IMPORT/EXPORT			
Fixed-length ASCII	■	■	■
Comma-delimited ASCII	■	■	■
.WK1 files	■	❑	■
.XLS files	❑	❑	❑
MULTIUSER SUPPORT			
Record locking	■	■	■
File locking	■	■	■
Configurable auto-refresh	■	■	■
Multiuser data entry	■	■	■
Multiuser queries for one table	■	■	■
Report generation restarts if table data is changed by another user	❑	❑	■
PROGRAMMING/APPLICATION DEVELOPMENT			
Directory-handling facilities	■	■	■
File I/O facilities (other than database file)	❑	■	❑
Runtime support cost	$1,295.00	$500.00	$49.95
Creates .EXE file	❑	❑	❑
Critical error-handling	■	■	■
Windowing or screen support	■	■	❑
Rollback facility	■	■	■
Commit facility	■	■	■
User-Defined Functions (UDFs)	■	■	■

■—Yes ❑—No
N/A—Not applicable: The product does not have this feature.

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dBASE IV (AND SELECTED COMPETITORS): SUMMARY OF FEATURES

Products listed in alphabetical order

	dBASE IV, Version 1.1	FoxPro, Version 1.02	Paradox, Version 3.5
Usage restrictions	❑	■	■
Array handling	■	■	■
Array subscripts required	■	■	❑
Refer to elements by name	❑	❑	■
APPLICATION GENERATION			
Quick application generation	■	■	■
Creates horizontal menus	■	■	■
Creates pop-up menus	■	■	❑
Creates pull-down menus	■	■	❑
DEBUGGER			
Maintain/set variables	■	■	■
Single-step execution	■	■	■
Breakpoints	■	■	■
Watchpoints	■	■	■
Editor integrated in debugger	■	■	❑
OUTPUT FACILITIES/QUERY LANGUAGE			
Search first	■	■	■
Search next	■	■	■
Pattern matching	■	■	■
Multifile access	■	■	■
Multifile search	❑	■	■
Query by example	■	❑	■
Can store queries	■	■	■
Multitable editing built into forms	❑	■	■
Interactive SQL support	■	❑	■
SQL server/remote database support	❑	N/A	■
Programming language expression can be embedded in SQL	■	N/A	■
REPORT WRITER			
Form-based reports	■	■	■
Line-based reports	■	■	■
Multifile access	■	■	■
Break on number of records	■	■	■
Break on change in value or expression	■	■	■
Number of predefined labels	9	9	None
Quick report layout	■	■	■
SCREEN DESIGNER			
Automatically maintains multitable links	❑	❑	■
Includes built-in multitable forms	❑	■	■
PRESENTATION FACILITIES			
Crosstabs	❑	❑	■
Graphs	❑	❑	■
INPUT FACILITIES			
Forms designer	■	■	■
Field and column attributes	■	■	■
Field validation:			
For specific values	■	■	■
Via range	■	■	■
Via lookup table	■	■	■
Forced uppercase	■	■	■
Forced uniqueness	■	❑	■
Calculated fields	■	■	■
Carry over fields (from previous record)	■	■	■

■—Yes ❑—No
N/A—Not applicable: The product does not have this feature.

CONTINUES

you replace the contents of a record with the contents of an array. It's surprising that this wasn't provided when arrays were introduced in Version 1.0.

While the windowing facilities that were introduced in Version 1.0 were welcome additions, they didn't offer an easy way to save and restore screens. In an application you had to write code that would rebuild and redraw your window images if they had been overwritten. The SAVE SCREEN and RESTORE SCREEN commands now available allow you to move a screen image to and from a memory variable, and the RELEASE command will now operate on these variables. The new WINDOW function returns the name of the active window.

Developers will find that *dBASE IV*, Version 1.1, offers a welcome number of new commands and functions.

The new SET DIRECTORY command sets the working drive and directory in a single step, instead of SET PATH and the archaic SET DEFAULT. SET CURSOR lets you turn the cursor on and off. Better still, MODIFY COMMAND and MODIFY FILE now accept wildcard parameters. These can be passed to editors like BRIEF, which can open multiple files.

Best of all, you can now use UDFs in place of any valid *dBASE* expression almost anywhere in *dBASE IV*. This is one of the first real innovations on the part of Ashton-Tate for this particular package. It means that anywhere you can use a *dBASE* expression—in QBE, applications, or when defining calculated fields—you can insert your own UDFs. You can use any command or function in a UDF, in a SQL program, or even with the *dBASE* macro operator ("&"). You can even create "user-defined work surfaces" that will create new fields and input attributes or even modify the template language to generate code based on your UDFs. In fact, you can even write a recursive

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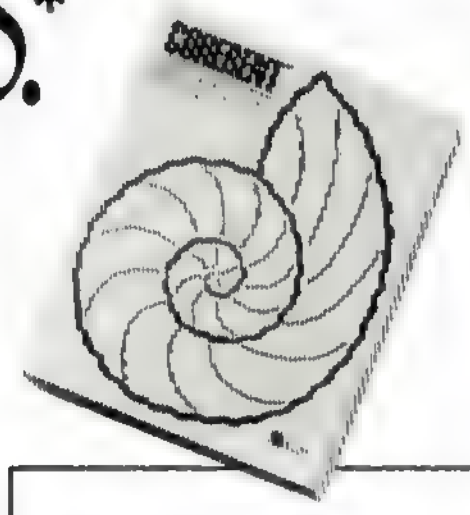

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Install Time	20-30 min.	3-4 hours
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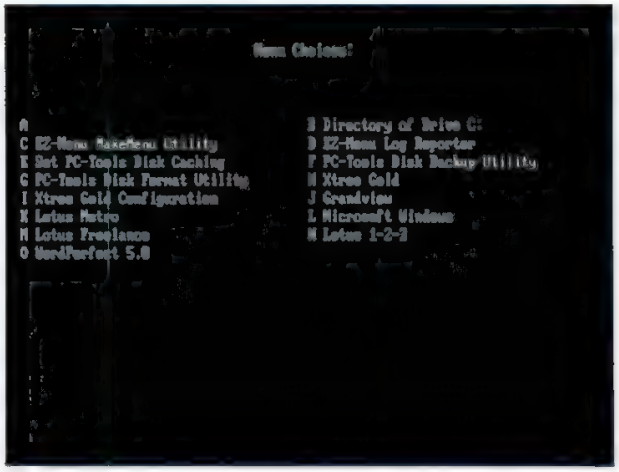
UDF—a UDF that calls itself—if you dare.

Recursive functions can crash a program regardless of what programming language you use, but they're not dangerous if you write them correctly. While Ashton-Tate has lifted most of the restrictions on UDFs, as well as the ON ERROR, ON ESCAPE, and ON KEY commands, you can still protect your applications via the new SET DBTRAP command. Among other functions, this command saves the current program and database environment before executing a UDF or any of the three ON commands. It also prohibits recursive UDFs from executing. In expanding the powers of UDFs and ON commands, while still providing a safe environment for developers who want it, Ashton-Tate is really leaving the choice up to developers, as it should be.



dBASE IV's Query-By-Example feature now offers a menu-driven interface along with the traditional fill-in-the-blank query form.

MEMORY REQUIREMENTS

Perhaps the most dramatic difference between *dBASE IV*, Version 1.0, and Version 1.1 is Version 1.1's reduced memory requirements. While you need to have 640K RAM installed, you can run the program with as little as 450K available. This is lower than the 640K requirement in Version 1.0, and gives you room to run sizable applications as well as load network software. There simply wasn't any room to run these in Version 1.0.

Version 1.1 automatically installs and runs DBCACHE, a special version of HyperWare's *HyperDisk* caching software. Using either extended or expanded memory, this cache sometimes improves the performance of interactive *dBASE* functions, such as swapping the Control Center overlays, and *dBASE* application programs. DBCACHE routinely caches disk reads and offers a number of options, including the amount of extended memory it can use, whether to verify disk writes, and whether to cache floppy disk drives. Its most important feature, however, is its ability to offer staged or delayed writes. With delayed writes, data is written to the disk when it's convenient for the cache, not when you update a record. While this feature does improve performance significantly, it introduces a little risk. If a power outage occurs before the disk is updated, your data is lost.

Unfortunately, DBCACHE isn't the best caching software available—MultiSoft's *Super PC-Kwik* would have been a better choice. Additionally, DBCACHE is *dBASE*'s only way of accessing extended or expanded memory. Unlike *FoxPro*, which can use expanded memory and a small amount of extended memory, and *Paradox*, which can use both, *dBASE IV* doesn't take advantage of either one, except via DBCACHE.

Caching isn't always the most effective way of using all that extra memory. A cache only retains recently read and written disk sectors. Intelligent memory managers, like those found in *FoxPro* or *Paradox*, retain the database objects that are the most frequently and most recently used. While Version 1.1 of *dBASE IV* offers dMMS, a system for managing its overlays, it doesn't manage database objects. If our performance tests are any indication, you can safely put your money on the database manager that relies on intelligent memory management, and not

DBASE IV (AND SELECTED COMPETITORS): SUMMARY OF FEATURES

Products listed in alphabetical order

	dBASE IV, Version 1.1	FoxPro, Version 1.02	Paradox, Version 3.5
VALIDATION CHECKING			
Required values	■	■	■
View lookup lists	■	■	■
Fill in from lookup lists	■	■	■
DATA TYPES			
Character	■	■	■
Currency	❑	❑	■
Date	■	■	■
Logical (Boolean)	■	■	❑
Memo (long text)	■	■	❑
Numeric (floating-point)	■	■	■
Short numeric	❑	❑	■
Editable macros	■	❑	■
SECURITY			
Password protection	■	❑	■
Field locking	■	❑	■
File locking	■	■	■
Table locking	■	■	■
Record locking	■	■	❑
Encryption	■	❑	■

■—Yes ❑—No

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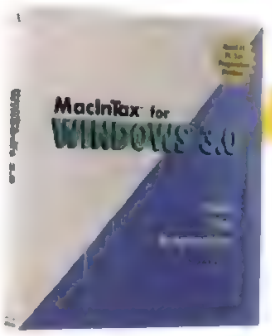

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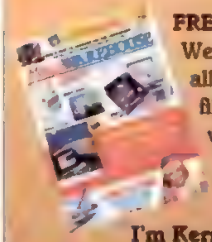

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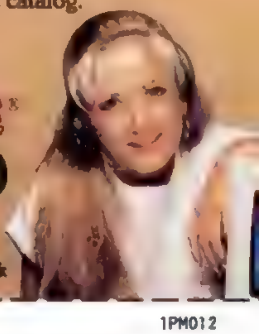

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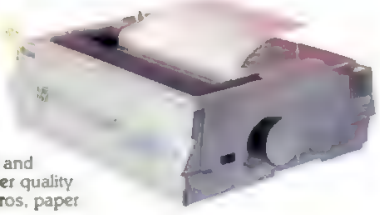

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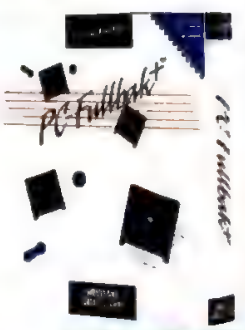

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MicroWAREHOUSE 1-800-367-7080

Blackjack
(MicroAce) Learn the strategies of Blackjack at home! Just choose the strategy you wish to master, set the rules and begin to have fun. Evaluates your plays and strategy errors and records them for your review. **$30.**

★ **Icon Designer**
(hDC Computer Corp.) Design and store your own Windows icons. A collection of 125 icons gets you started or use an editor and a 16-color palette to design your own. Access Icon Designer from any Windows application. **$35.**

Lotus Agenda
(Lotus) Lotus Agenda is your solution to managing people, projects and time. Consolidates and organizes information any way you want it. Features "To Do" list, personalized task manager and much more. **$49.**

Enable B/P
(Enable Software) Enable B/P is office integration software that is packed with flexible features such as word processing, a fully relational database, graphics capabilities and tele-communcations. **$119.**

★ **PageMaker 3.01**
(Aldus) PageMaker 3.01 runs faster under Windows 3.0 and has new import filters for RTF files. Control type styles and placement, wrap text around graphics and reformat text in one command. **$499.**

UnMouse

(MicroTouch Systems, Inc.)
Use the most intuitive pointing device ever designed—your own finger. Introducing the UnMouse by MicroTouch. One million touch points and a touch sensitive glass tablet respond instantly to your touch. Unique templates allow you to execute function keys directly from the tablet. Also featuring truly outstanding graphics capabilities. **$109.**

MicroAce
Blackjack ..... 30.
Microsoft
★ Flight Simulator 4.0 ..... 45.
Learning DOS ..... 39.
PC Globe Inc.
PC Globe 4.0 ..... 39.
PC Nation ..... 19.
PC USA 2.0 ..... 39.
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★ Omnipage 2.1 386 ..... 609.
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★ CorelDRAW! 2.0 ..... 319.
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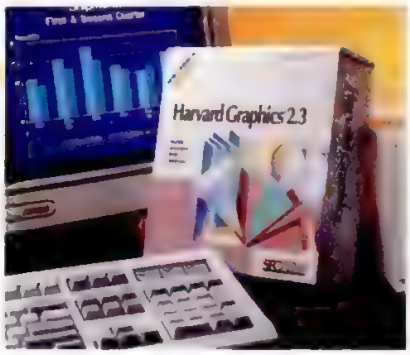
GEM Artline ..... 419.
Dunn Systems
★ Artclips for Toolbook ..... 112.
Fox Software
Fox Graph ..... 174.
Good Software
Arriba ..... 103.

Harvard Graphics 2.3

(Software Publishing)
Whether you need overhead transparencies, 35mm slides or illustrations for written reports, Harvard Graphics can handle the job. Its intuitive and menu-driven interface allows you to inport graphics from up to seven applications without leaving the program. Enhance your charts and graphs before sending them to your desktop publisher or word processor. **$329.**



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Adobe
Adobe Fonts (various) ..... Call.
★ Adobe Type Manager ..... 55.
★ Illustrator - Windows version ..... 369.
★ Streamline-Windows version ..... 219.
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★ PageMaker 3.01 ..... 499.
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★ ArtRight Images Vol. 1 or 2 ..... 85.
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★ AutoDesk Animator ..... 249.
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ClipArt (various) ..... Call.
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★ Xport ..... 279.
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Microsoft
★ Powerpoint for Windows ..... 319.
New Visions Technology
★ Presentation Task Force ..... 134.
Power Up Software
Express Publisher 2.0 ..... 83.

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(Perma Power) Standby Power Systems is your total solution for power line protection problems with the benefits of on-line systems and the efficiency of standby systems. Offers a patented safe start sensor, recognizes damaging line voltages, allows longer run time, has 4 outlets and more. 500L and 250 available with two-year warranty. 500L is LAN ready. **$499 and $249.**

Software Publishing
Art Gallery ..... 89.
Harvard Graphics 2.3 ..... 329.
First Publisher 3.0 w/Deluxe Paint ..... 95.
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The Newsroom Pro 1.0 ..... 23.
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Quick Graph ..... 79.
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ClickArt (various) ..... Call.
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★ Thinx ..... 323.
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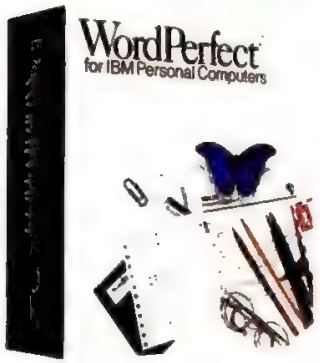

WordPerfect 5.1

(WordPerfect Corp.)
WordPerfect version 5.1 comes complete with new, innovative features to provide you with even greater flexibility. Bold new features include pull-down menus, mouse support, tables, an equation editor and extensive graphics printing support. **$255.**

Form Filler 3.0 ..... 84.
Form Tool Gold ..... 58.
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Enable 5 Pack Workstation ..... 1215.
Enable BP ..... 119.
Famware
Family Fortune ..... 39.
Family Reunion ..... 39.

25 Plus/Charisma

(Elite Business Apps)
This revolutionary laser printer cartridge system will forever change the way you output routine documents. The Charisma eliminates the needless waste of buying new cartidges every time you want to build your typeface library. Features the exclusive plug-in module system which allows you to put together your own collection of additional typefaces, headlines and custom graphics. **$299.**

Fifth Generation
Brooklyn Bridge 3.0 ..... 88.
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★ Excel for Windows 2.1C ..... 309.
★ License Pack Excel For Windows ..... 299.
★ License Pack PowerPoint For Windows ..... 299.
★ License Pack Word For Windows ..... 299.
★ Productivity Pack ..... 42.
★ Project for Windows 1.0 ..... 459.
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★ Windows Developer's Tool Kit ..... 325.
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★ Word for Windows 1.1 ..... 319.
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MyAdvancedMailList ..... 33.
MyCheckbook ..... 19.
MyLabelMaker ..... 19.
NBI, Inc.
★ Legacy ..... 298.
Nolo Press
For the Record ..... 36.

backpack

(MicroSolutions) The backpack makes adding a disk drive a snap. This external floppy drive plugs into your parallel printer port; there are no interface cards to install. Works with any computer with an IBM compatible parellel port and allows you to add drives even if you don't have expansion slots. Available in 3.5 inch and 5.25 in models. **$259.**

DOS Partner
(EasySoft) Announcing a DOS shell that requires no knowledge of DOS to use. Includes an Application Menu Manager, File Manager or Dos shell and Drive Manager or Basic Disk utility. Features on-line help, mouse support and more. **$59.**

BRIEF for DOS and OS/2
(Solution Systems) BRIEF—The leading programmer's editor–puts unmatched editing power and flexibility into your hands. Intuitive, multilevel undos, complete macro language and more. **Now save $25 with rebate**–call for details. **$179.**

TaxCut
(MECA) This tax season, prepare an expert-quality tax return on your PC with TaxCut. Expert help is available every step of the way and TaxCut won't let you quit until your returns are complete and accurate. **$55.**

PC-File 5.0
(ButtonWare) Turn data into impressive reports, charts and graphs with PC-File. Holds up to one billion records per file, reads and writes dBASE files directly, offers LAN support, integrates a word processor and much more. **$72.**

The Universal Word
(WYSIWYG) This full-featured, multi-language word processing program offers true (WYSIWYG), a choice of fonts, styles and typefaces, plus superior editing capabilities. Get laser typesetting quality on dot matrix printers **$118.**

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Quicken 3.0
(Intuit) Quicken 3.0 is an easy to use financial manager for personal or small business use. Manages your payables, receivables, savings and more. Balanaces your checkbook, reconciles your bank accounts, prints out checks and much more. **$35.**

LabelPro
(Avery)
Print professional-looking labels from your laser printer! Use clip art and scalable fonts or scan in your logo. Imports dBASE and WordPerfect; supports HP LaserJet and compatibles. Also available is LabelPro for dot matrix. **$49.**

1990 TaxMagician
(Iris Systems) TaxMagician contains all forms in IRS taxpayers' booklets and generates government approved substitute forms. Overlays for pages 1 and 2 included. Optional electronic filing via diskette (no modem required). **$45.**

Disk Optimizer
(SoftLogic Solutions) Restore your hard disk to its youthful speed with Disk Optimizer, the utlity software that retrieves your files up to three times faster. Undoes file fragmentation. **$39.**

Peachtree Complete III
(PeachtreeSoftware) Let Peachtree Complete handle your business accounting needs. This full featured software includes a General Ledger, Accounts Payable, Accounts Receivable, Purchase Orders, Payroll, Inventory and more. **$149.**

Willmaker 4.0 ..... 36.
Norton Lambert
Close Up Customer/Terminal ..... 119.
Close Up Support/ASC 3.0 ..... 154.
Okna Corporation
★ Desk Top Set ..... 85.
On The Go Software
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★ Superbase 4 Windows ..... 439.
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★ Your Way ..... 116.
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★ Windows Word for Word ..... 45.
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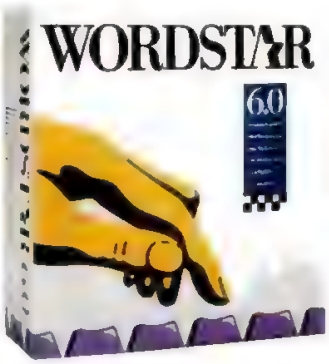

WordStar 6.0

(WordStar)
WordStar 6.0 now comes with a set of scalable laser, soft fonts. View type in sizes up to 72 points and print them in sizes from 0.1 to 999.9 points. Features actual text display, up to eight variable-width columns per page, mixing of text and graphics and full support of both hand held and regular scanners. **$256.**

QMS
★ Ultrascript PC 2.1 ..... 119.
★ Ultrascript PC Plus 2.1 ..... 249.
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386Max Professional ..... 75.
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1990 Tax Magician ..... 45.
MECA
TaxCut ..... 55.
Simon & Schuster
J.K. Lasser Tax Advantage 1990 ..... 25.

NEW!

Color Scanner CS 4096

(Migraph) The Color Scanner from Migraph includes three separate Windows 3.0 compatible software packages and a half length interface card. Included is a special version of Astral's Picture Publisher Plus, a quick scan and save utility and ImagePrep. Scan and sane 4096 colors and save the file in any TIFF format, color, grayscale or monochrome PCX. **$695.**

Softview
★ MacInTax for Windows ..... 75.

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Asymetrix
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Borland International
Turbo C++ ..... 135.
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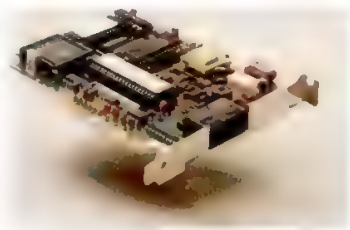
Spinnaker Software
Spinnaker Plus ..... 285.
Symantec
Norton Editor 1.3 ..... 56.

Smart One FAX9624

(Best Data Products) The SmartOne FAX9624 is a full featured 9600 bps send and receive fax modem as well as a 2400 bps Hayes compatible data modem on a half card. The SmartOne FAX9624 offers true background operation plus, multiple file and destination send. Includes fax and modem software, Compuserve and Prodigy start-up kit offers and a two-year warranty. **$259.**



CIRCLE 225 ON READER SERVICE CARD

PERFORMANCE TESTS: DATABASES

Although the new version of *dBASE IV*, Version 1.1, is a better performer than its predecessors, both *FoxPro* and *Paradox* are giving it a run for its money.

The **Build Table** test measures the time required to build a table with a single index key. Each database manager uses its import facilities to import a fixed-length or comma-delimited ASCII file. If the index is built separately, the time used to build the index is added to the time needed to build the table.

The **Search** test measures the time required to locate the first row where the Make column = "Fendhi" and the Model column = "Coupe" in the test database. The index remains on for this test.

The **Unconditional Change** test measures the time required to change every row in a table by replacing the BuyPrice column with BuyPrice * 1.1 in the test database.

The **Conditional Change** test measures the time required to make a global change in a subset of records in the column where Color = "red" in the test database. The contents of that column are replaced with "candy apple."

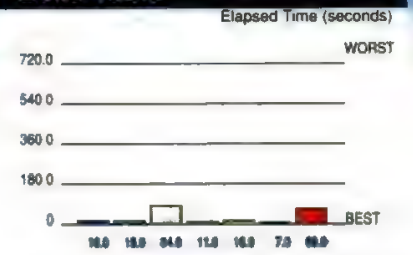
The **Summary** test measures the package's ability to run calculations against several columns and several sets of rows. The test calculates the total sales and purchases for each unique Part ID found in the test database table. For each Part ID, it calculates sales times units, and purchases times units, and then displays the results for each Part ID.

The **Display View and Join** test measures the time required to traverse a set of one to many relationships and display the related rows. A table or view is created from the Part ID, Make, Model, Year, Description, and Color columns in the main table of the test database. Another table or view is created from the remaining columns plus Part ID, but it includes only those rows where BuyPrice is greater than zero. This results in only purchase transactions being placed in this table. The second view is joined to the first one via Part ID, and the resulting join is printed to a text file.

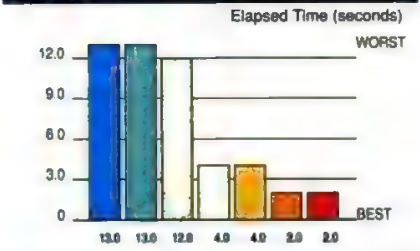
The **Report** test measures the time required to use two joined views to produce a report. It tests the package's report-generation facilities, as well as its ability to traverse two joined views in a report context. Two views like those created in the Display View and Join test are used. Only the latter table consists of Sales transactions (SellPrice greater than zero). The resulting report is printed to a text file.

5,000 RECORDS

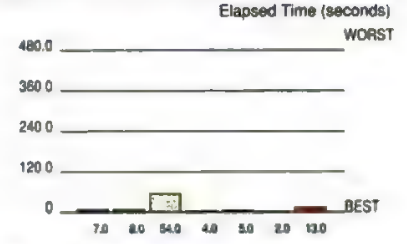
Build Table



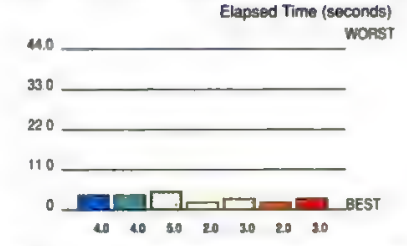
Search



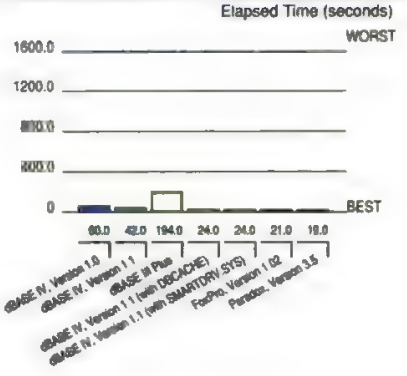
Unconditional Change



Conditional Change

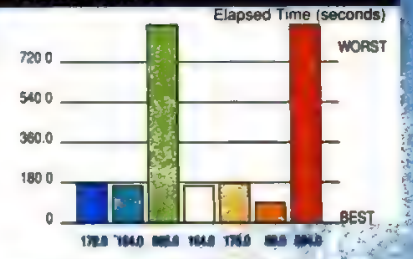


Summary

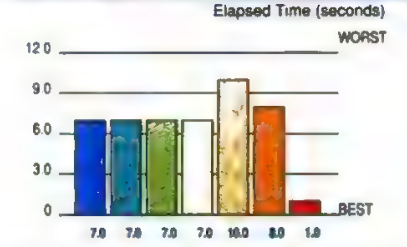


50,000 RECORDS

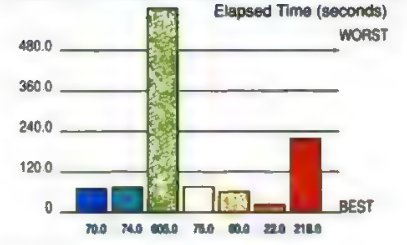
Build Table



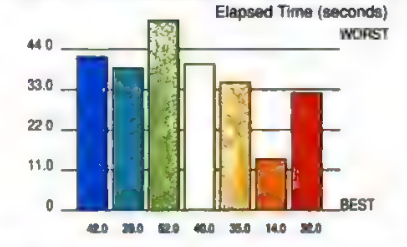
Search



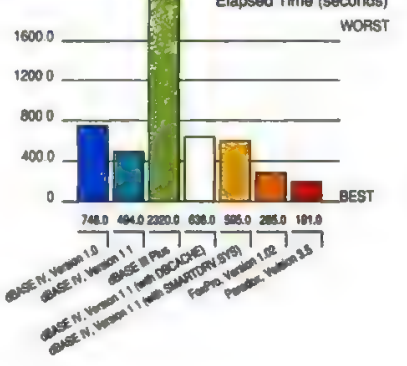
Unconditional Change

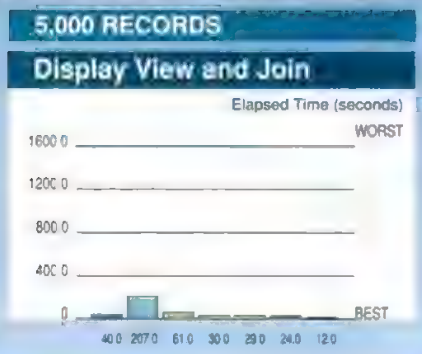


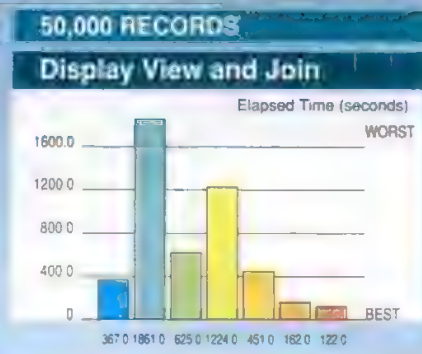
Conditional Change



Summary







Of the database packages tested here, *FoxPro*, Version 1.02, displays outstanding performance on almost every test, with *Paradox*, Version 3.5, following right behind. *FoxPro* performs best when the entire database needs processing (the Build Table and Change tests). While its performance was respectable to mediocre on the 50,000-record Search test, *FoxPro*'s database engine raced when it executed report-generated code.

Paradox outshines *FoxPro* on the Summary and Display View tests, highlighting its superior ability to manage and retrieve data when large-set operations are being performed. Its dynamic query optimization earns it the first-place position on the 50,000-record Search test. Its worst performance, on the Build Table and Unconditional Change tests, came when it had to process every database record—a task for which it is not really designed. Fortunately, most users rarely perform global activities.

dBASE IV, Version 1.1, shows improvement over *dBASE III Plus* and *dBASE IV*, Version 1.0, particularly when DBCACHE is installed. But how universally effective is DBCACHE? Version 1.1 is generally better on the 5,000-record tests with DBCACHE. But in the 50,000-record tests, only on the Display View and Report tests did *dBASE IV* 1.1 return markedly better performance with DBCACHE than without it. And using DBCACHE actually slows down this version of *dBASE* on the 50,000-record Summary test.

To test the effectiveness of DBCACHE further, we tested *dBASE IV* with another disk cache: the less-than-fantastic SMARTDRV.SYS from *Microsoft Windows* 3.0. Running *dBASE IV* with SMARTDRV.SYS yields test times close to, equivalent to, or in the case of the 50,000-record Summary and Display View tests, even faster than when DBCACHE is loaded. It's safe to say that experimenting with another cache will probably bring you better performance for *dBASE IV* 1.1 than DBCACHE will.

CONTINUES

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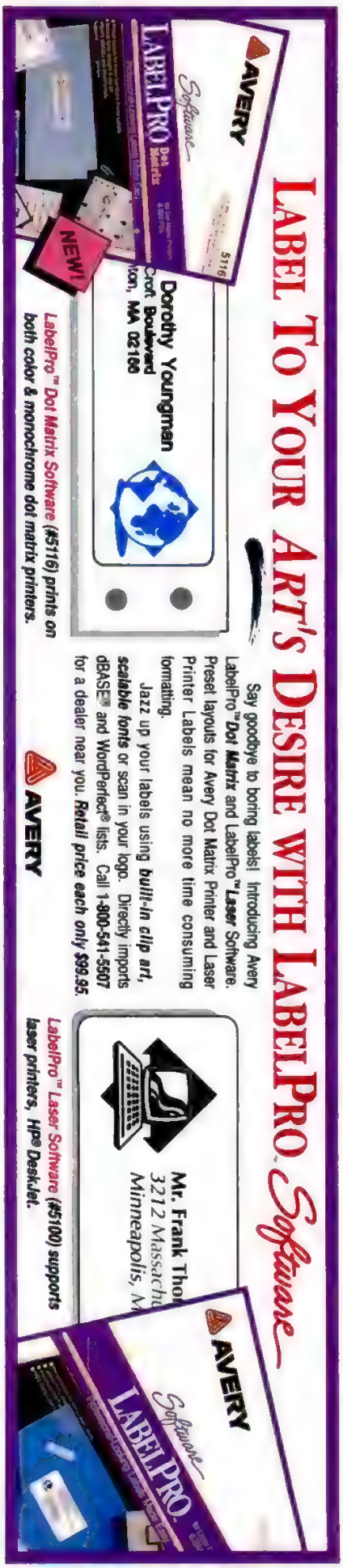

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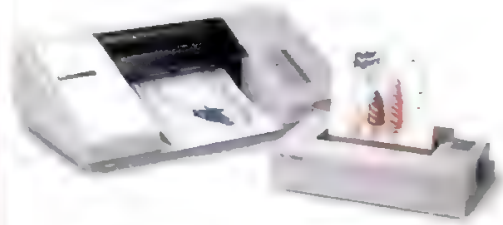

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VGA emulation	No	No	Yes
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PM01a

on a less-effective disk cache.

Finally, Version 1.1 lets you set several DOS environment variables—DBHEAP, DBTMP and BAK—to balance the use of memory for overlay swapping and to set the location of temporary and backup files.

PERFORMANCE

Compared with *dBASE III Plus*, *dBASE IV*, Version 1.1 is as much as five times faster, and that's with the DBCACHE disk cache turned off. In many cases, it's faster still with the cache turned on. Yet for some operations, you'll find that Version 1.1 doesn't run particularly fast, whether the cache is installed or not. Indeed, you might be quite a bit better off with another cache altogether. SMARTDRV.SYS, the cache supplied with *Microsoft Windows*, has never been known as an outstanding disk caching tool, yet *dBASE IV* performed well with it in place of DBCACHE. In a few tests, it outperformed DBCACHE. If you're going to use *dBASE IV*, you'll do well to look around at some of the other caches currently available in the PC marketplace.

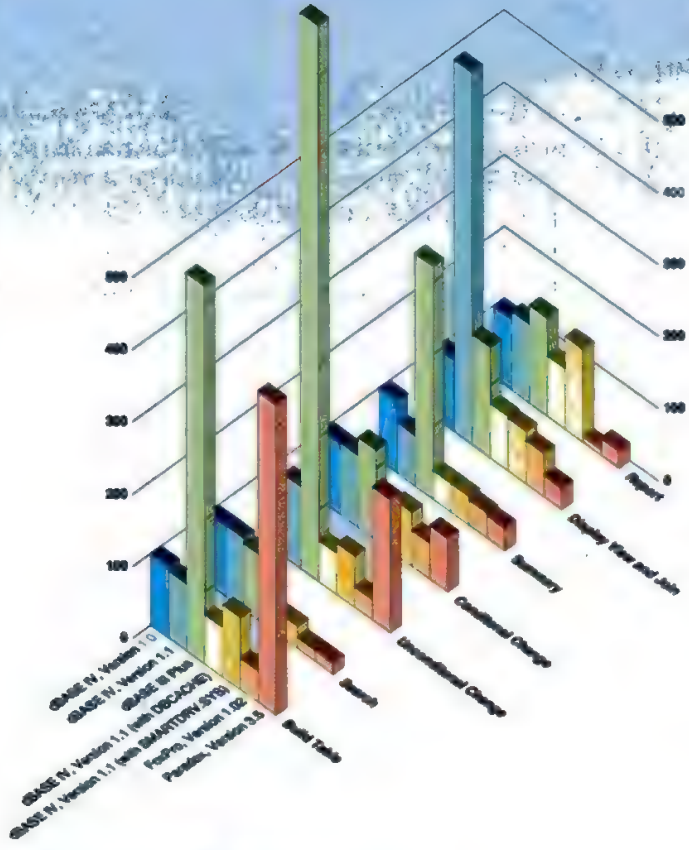
When compared with *FoxPro*, Version 1.02, and *Paradox*, Version 3.5, *dBASE IV* 1.1 lagged behind on many tests. It performed best against *Paradox* when the entire table was being processed, but *Paradox* consistently beat *dBASE* in the Display View and Join, Report, Summary, and Search tests. This was most likely due to *Paradox*'s dynamic query optimization facilities and its ability to take advantage of extended memory.

PERFORMANCE TESTS: DATABASES

LABS

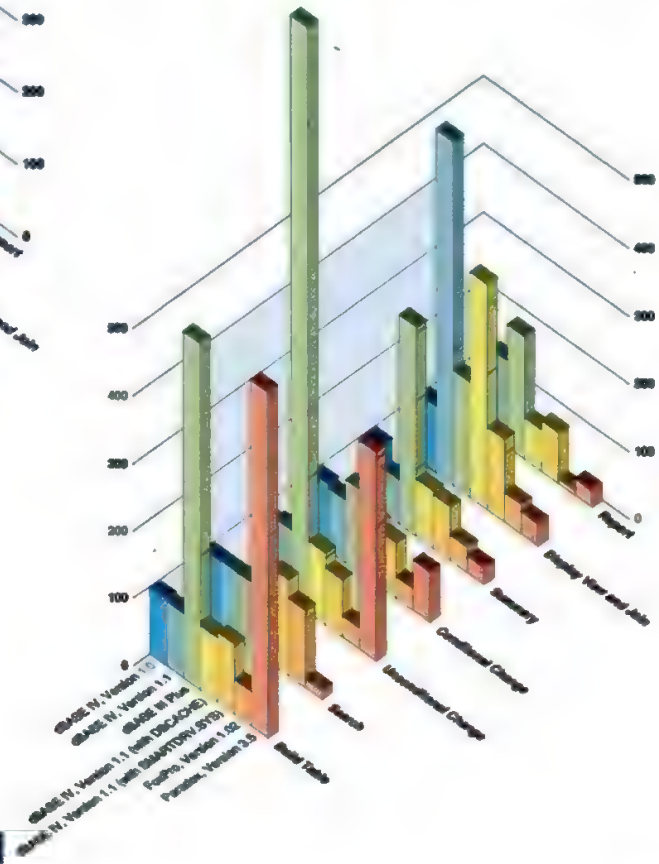
For our tests, we used a 33-MHz Northgate Elegance 80386 with a 200MB hard disk and 8MB RAM. 7MB was configured as extended memory. We conducted the tests using DOS 4.01 with FILES=30 and BUFFERS=30 included in the CONFIG.SYS file. ANSI.SYS was the only driver loaded for all tests, except in the SMARTDRV.SYS test for *dBASE IV*.

The tests were timed automatically, except for the *dBASE IV* 50,000-record Report test (which tended to lock the machine). The results are rounded to the nearest second.



5,000 RECORDS

Relative Times
(*dBASE IV*, Version 1.0 = 100)



50,000 RECORDS

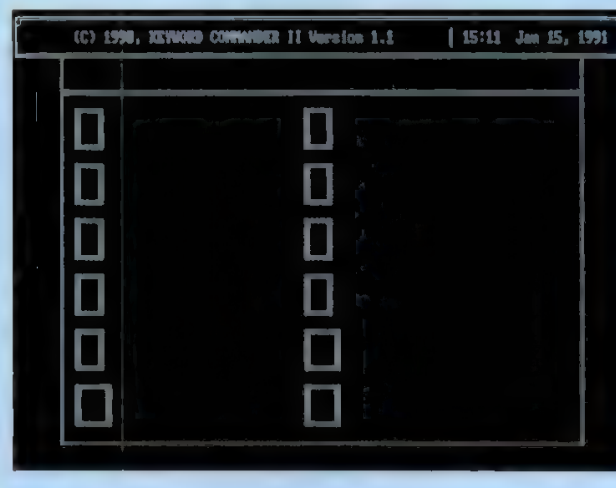
ENDS

FoxPro, however, gave *dBASE IV* an even greater trouncing, and it was executing the identical code used by *dBASE IV* in its tests. Even where the testing operation favored *dBASE*'s record-oriented database operations, *FoxPro* outperformed it.

DBASE IV SQL

dBASE IV's SQL implementation has been improved considerably. Ashton-Tate has done a far better job this time integrating *dBASE* and SQL, further blurring the line between *dBASE* (a good application programming language) and SQL (an excellent query and update language). There's been a lot of SQL bug-fixing, too. On a multiuser system, one user can no longer DROP a database that's been started by another user. You can BROWSE SQL tables, as well as run reports, labels, queries, or any other Control Center function against them. There are over 20 *dBASE* commands that can be executed while in SQL mode, including USE, APPEND, CREATE, EDIT, and MODIFY STRUCTURE.

Considering *dBASE*'s largely record-oriented database commands, it's a significant achievement that Ashton-Tate has been able to implement set-oriented access to *dBASE* files using SQL. Version 1.0's SQL was slow and bug-filled, so the improvement is welcome.



In *dBASE IV* 1.1 you don't need to exit to DOS to copy, move, or rename DOS files. Any file can be accessed and viewed from the package's DOS Utilities Menu.

However, it is still cumbersome to take advantage of the SQL module. Since *dBASE*'s SQL operates much like IBM's *DB2* mainframe relational database management system, a set of system tables are used to catalog and organize all the tables (with field information), indexes, and other components of a database. In the *dBASE IV* implementation, these are stored in ordinary *dBASE IV* .DBF files and placed in the SQLHOME subdirectory. The latter is created in your *dBASE IV* directory when you install *dBASE*. When you execute a SQL command, *dBASE IV* has to convert it into the equivalent *dBASE* commands. This can slow down SQL appreciably.

The only real caveat to keep in mind when using the SQL component is to avoid mixing *dBASE* commands with SQL commands of the same name. For example, DELETE and SELECT have counterparts in both languages that have entirely different meanings. Also, you have to take several steps to create a SQL database in a subdirectory other than SQLHOME. While a program (SQLHOME.EXE) does part of the work for you, it would have been easier if the package set up new SQL databases for you automatically.

The idea of supplying *dBASE* with the facility for set-oriented operations—which it lacks—is a good one. But it may not have been the path to take. There are too many subtle differences between *dBASE* and SQL. Consequently, SQL appears to be little more than an appendage to record-oriented *dBASE*.

It would have been simpler to provide *dBASE* developers with set-oriented database commands like *Paradox*'s embedded QBE where queries are saved and called from inside a *Paradox* application.

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Paradox does offer a SQL implementation, but it's almost exclusively designed for remote table access to a number of different SQL servers. *Paradox* aficionados need not learn SQL, since they invoke set operations via embedded QBE. *Paradox* simply translates these to the appropriate SQL dialect for operations against remote, SQL server-controlled tables. While *FoxPro* currently lacks a set-oriented database interface, it's likely that Fox Software will take an innovative approach that will give *dBASE IV* a further run for the money.

While *dBASE IV*, Version 1.1, doesn't leave *FoxPro* or *Paradox* in the dust, Ashton-Tate's long nightmare is over.

OUTPUT FACILITIES

dBASE IV's Report Generator has also changed in Version 1.1. Instead of printing a report directly, it generates a *dBASE* program first, much like the QBE module does. Due to program generation, *dBASE* may be slow the first time you generate a report, but subsequent reports will run as fast as it takes to execute the report. Further, the Report Generator can create groups for all "n" records and break on field contents. Also, it can access multiple related files when you use views in the formulas of calculated fields.

By generating a *dBASE* program, the Report and Label Generators take better advantage of *dBASE IV*'s improved printer support. There are 80 printer drivers in all (*Paradox* only has 23 and *FoxPro* doesn't offer any), with support for over 200 printers, including full support for laser and PostScript printers, and XON/XOFF support for serial PostScript printers. There are even drivers for Hewlett-Packard printers with portrait and landscape modes. *dBASE IV* can keep up to four drivers loaded at one time and switch drivers from inside an application program. The "?" command now allows for font control, and a function is also available to write control codes to the printer without affecting row/column counts, which was a problem with *dBASE III Plus*. While Ashton-Tate has indicated that a program for creating your own printer drivers is available from their technical support staff, it isn't clear why this wasn't included with *dBASE IV*.

THE BOTTOM LINE

If you currently own *dBASE IV*, Version 1.0, you'll want to take advantage of the free upgrade to Version 1.1. *dBASE III Plus* users can upgrade to Version 1.1 for $175 or to the Developer's Edition for $475. (The Developer's Edition comes with the royalty-free, unlimited distribution runtime module, the source code to the template language, and three LAN keys. It lists for $1,295.) If you're committed to Ashton-Tate's products, the upgrades are an excellent value.

If you're committed to using the *dBASE* language, but not to any particular implementation, look elsewhere. While *dBASE IV* has come a long way, Fox Software's *FoxPro* 1.02 packs much better performance, an excellent implementation of the *dBASE* language, and an outstanding user interface. You won't regret a single minute you spend with it.

If you found *dBASE*'s QBE attractive and want to consider a set-oriented approach to database management, you should seriously consider *Paradox*. While the user interface is not as intriguing as that of *FoxPro*, you'll find that database operations are more intuitive and that the system will do a great deal of the dirty work for you.

While *dBASE IV*, Version 1.1, doesn't leave *FoxPro* or *Paradox* in the dust, Ashton-Tate's long nightmare is over. It has reestablished its prominent role in the PC database market, and its staff seems committed to gaining back the place that *dBASE* once held. The rebirth of *dBASE IV* means more competition, and that promises to drive competitors to produce better database products for everyone. ■

Richard Hale Shaw is a contributing editor of PC Magazine.

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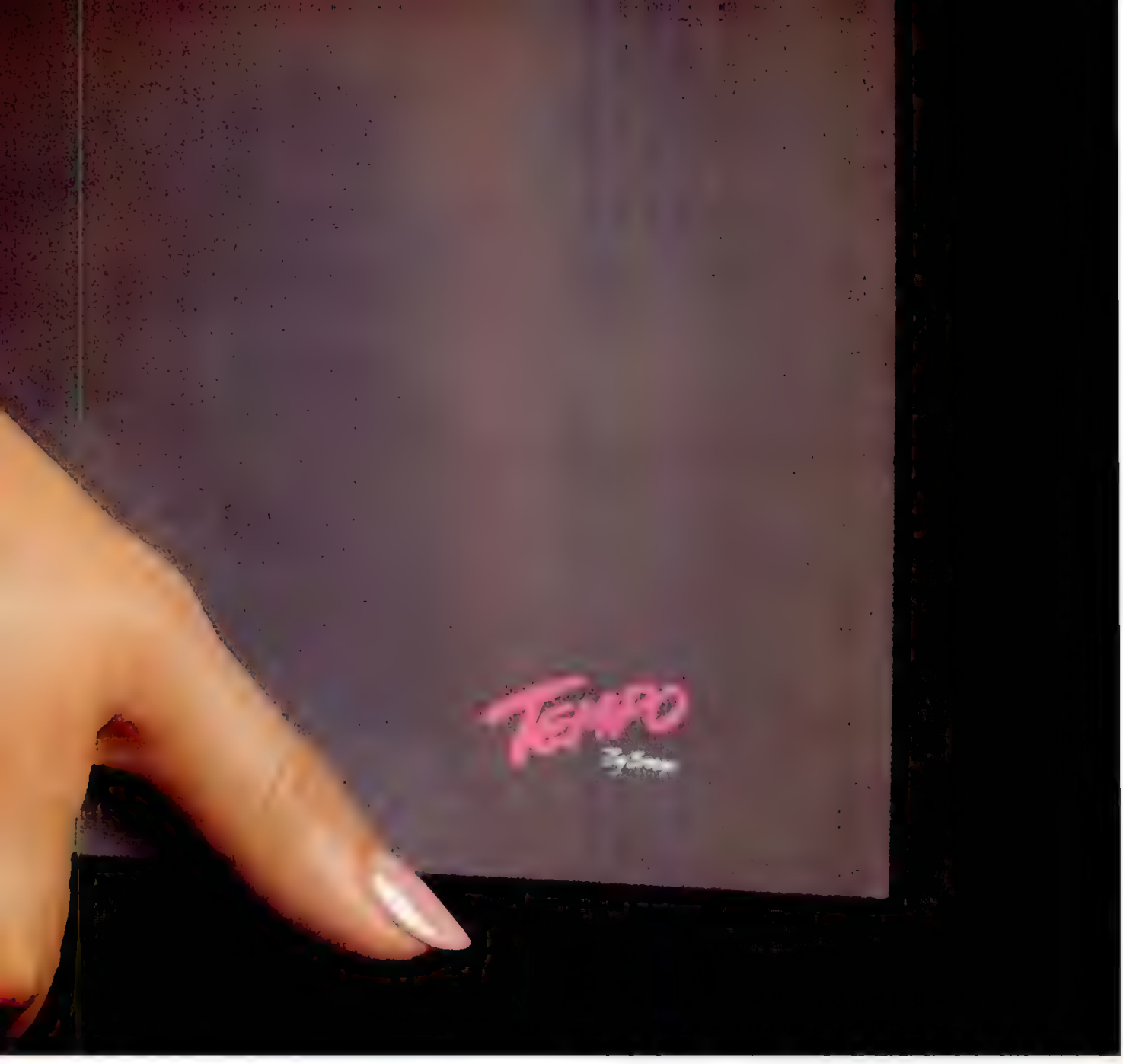

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NAME AND ADDRESS FOR LESS

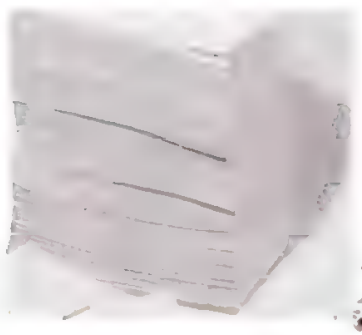
Envelope Printers Cut Your Costs

***PC Magazine* reviews four printers that'll make addressing your envelopes a snap—and they'll cut mailing costs, too!**

by Alfred Poor

Today's business world seems dominated by instant communications—cellular phones, fax machines, and electronic mail are commonplace. Yet the foot soldier of industry remains the Number 10 envelope, delivered anywhere in the country by the United States Postal Service for a paltry quarter, or less if you qualify for any of a variety of discounts.

The difficulty is that envelopes are a major headache for most computer printers. Machines that are designed to handle fan-fold or cut-sheet paper reliably and rapidly often go weak in the knees when confronted with a simple little stack of envelopes. You end up coping with small capacity bins, jammed paper paths, and aggravating format problems. Many people keep an old IBM Selectric handy just for addressing envelopes.



PHOTOGRAPH: PETER NEUMANN

EDITORS' CHOICE

● All solid products, but no Editors' Choice

The three different envelope printers tested here create a balanced mix of speed, paper handling, and print quality. They're also capable of adding bar codes so that you can take advantage of postal discounts.

The Primages/Bryce printer, using daisy wheel technology, offers the best print quality with the smallest input capacity—only 100 envelopes—and the slowest default speed; but at $3,000 (Primages) or $3,295 (Bryce), it's also about $2,000 cheaper than its nearest print-quality competitor, the Datatech Scriptomatic DP1185.

The Datatech allows the highest input capacity—700 envelopes—and good speed (2.79 seconds per envelope) with the advantages of its 24-pin printhead. Print quality is good, but not on par with the daisy wheel Primages/Bryce. And the Datatech Sciptomatic's price, $5,195 as tested, was the highest of any printer here.

The $3,995, 9-pin, moderate-capacity Rena is the fastest of all: In its draft mode, the Rena is about 15 percent speedier than the Datatech—2.42 seconds per envelope. However, if pushed beyond draft to its NLQ mode, it's only three-quarters as fast (6.8 seconds per envelope) as the daisy wheel Primages/Bryce, with nowhere near the print quality.

One of these machines is sure to serve your particular requirements better than the other two. Keep in mind that all of them offer the same benefits: cheaper postage and more-accurate mail handling. If you spend $4,000 on one of these machines and manage to save 4 cents per letter, 200 letters per day will actually pay for the printer in about a year and a half.

ENVELOPE SOLUTIONS

But there are solutions available. The direct-mail marketing industry has had specialized products for label and envelope printing for a long time. The news is that these machines are now capable of working with most personal computers, but you'll find the Postal Service's attractive discounts on postage rates to be even more important.

In this article, we'll take a look at four printers that are dedicated to printing envelopes. The printers include entries from Bryce Office Systems, Datatech, Primages, and Rena Systems. (Primages makes the system sold by Bryce Office Systems, so they're both covered in a single review.) These machines take different approaches to solving the envelope problem, using different print technologies and offering various combinations of speed, print quality, price, and formatting flexibility.

THE POSTNET CRITERION

All of the printers covered here had to have one important capability, however: All of them can print the USPS "Postnet" bar codes on the envelopes when they print the address. The Postnet prints a bar code sequence of tall and short lines in the lower-right-hand corner of the envelope. The optical scanners in the Postal Service sorting machines can read these codes; the end result is faster and more-reliable sorting.

To understand the Postnet codes, we have to take a step back to look at the "ZIP+4" codes. Most of us have been trained by now to use the standard five-digit ZIP codes, but we tend to view the extra four digits of the ZIP+4 code as an aggravation. The fact is that the five-digit code only narrows the address down to the local delivery office. The first two digits of the four-digit extension identify a sector, and the last two a delivery segment. Sectors are assigned to very small geographic areas, while segments are even more specific—a side of a street, a department of a business, or a floor of an office building.

With the four-digit extension, the Postal Service mail-handling equipment is able to sort mail so that it can be handled most efficiently. Efficiency saves money, and money saved keeps postage rates down. As an extra incentive for businesses to use the ZIP+4 codes, the Postal Service also offers attractive discounts on postage rates for business customers that use the codes.

In addition to keeping postage rates down, envelope printers help ensure that your mail is handled faster and sorted more accurately.

POSTAL DISCOUNTS

To qualify for the ZIP+4 discounts, you can prepare your mail in one of two ways. You can print the address block so that it meets the USPS Optical Character Recognition (OCR) requirements, or you can print the Postnet bar codes. The OCR requirements are fairly stringent and can restrict the design and appearance of your mailing. The bar-code option offers the most flexible and simplest avenue.

You don't need to be a bulk mailer to benefit from these lower rates, either. Currently, there is no discount for first-class mail with bar codes, but new rates proposed for 1991 would offer a 3-cent lower rate for mailings as small as 250 pieces. If you sort those pieces based on the first three ZIP code digits, the new rates will drop an additional 2.2 cents. Right now, you can get a 5-cent discount by bar-coding and sorting by the first five digits, but under the new rates, the total discount for mail prepared this way is expected to be 5.7 cents. With this discount, 250 pieces a day will provide more than $3,000 per year in postage savings. Obviously, these printers can pay for themselves in a short time.

You also get some intangible benefits. Your mail will be handled faster, since it will not require human handling, which means it will probably be delivered more quickly. The bar code sorting is also more accurate, so your letters are less likely to be misdirected.

There is still the problem of getting the ZIP+4 codes for your addresses. Everyone has one, but few people know their own. Do you know yours? The Postal Service knows them all, of course, and it's

ENVELOPE PRINTERS: SUMMARY OF FEATURES

Products ordered alphabetically by company name

	Bryce Office Systems Inc. BOS 1200	Datatech Inc. Datatech Scriptomatic DP1185	Primages Inc. JE-1000 Envelope Addressing System	Rena Systems Inc. Rena DA-300
List price (as tested)	$3,295	$5,195	$3,000	$3,995
Print technology	Daisy wheel	24-pin	Daisy wheel	9-pin
Input hopper capacity	100	700	100	150
Rated material size (inches)				
Width (min./max.)	6.3 / 10	3.5 / 14.5	6.3 / 10	2 / any
Length (min./max.)	3.8 / 6.5	3.5 / 16.1	3.8 / 6.5	3 / 15.8
Automatic zip code recognition	■	❑	■	❑

■—Yes ❑—No

happy to tell you. If you have a mailing list smaller than 50,000 names, the USPS will accept a copy on-disk and return it to you with the correct codes added. Contact your local account representative or call the National Address Information Systems Center at (800) 238-3150. If you don't qualify for this service, there are private companies that will perform it for a fee.

SOFTWARE SOLUTIONS

There are other ways to get Postnet onto envelopes besides using dedicated printers. For example, there are dedicated mailing programs that can print the bar codes using a printer's graphics capabilities, such as *ArcList* from Group 1 Software (Greenbelt, Maryland) and *Today's PC Mail System* from Postalsoft (La Crosse, Wisconsin). You can also get utility programs that allow you to print envelopes when using your favorite word processor. ENV is a terminate-and-stay-resident (TSR) utility that can capture an address block from your PC's screen and print an envelope on a Hewlett-Packard LaserJet complete with Postnet bar code. The program costs $50 from Pike Creek Computer Company (Newark, Delaware).

Still, there are problems with these software approaches that may make it difficult to work with existing mailing lists that you maintain in other applications. Dedicated mail-list programs are designed for large-volume printing, while utilities can often print only a single envelope at a time.

That's where these special printers come into play. They accept the address block as a standard ASCII text stream. Some require that you repeat the ZIP+4 code after the address, while others can pick it up from the address block itself and reuse it to create the bar code. In either case, you can use most database and word processing programs to send the address information to the envelope printer in the required format.

Given the expense of these printers and their special capabilities, they're of interest for two major types of installations. You should consider one of these machines if you routinely mail even moderate quantities of letters from a given list. For example, if you have a press release list with more than 200 addresses, you should consider printing the envelopes with one of these printers.

The other case is where you have a large number of people producing correspondence on a local area network. Through the use of print servers, you may already be sharing laser printers for printing the letters themselves. The same techniques could be used to send address information to a shared envelope printer, and as long as you have 250 pieces with ZIP+4 information, you can reap the benefits of the cheaper postal rates. Even if you don't have that many letters in one day, you still gain by having the bar-coded letters handled more efficiently and accurately by the Postal Service.

In reading the reviews that follow, consider your needs as you compare features. Even though the field is small, you'll find broad differences in speed, capacity, fonts, quality, flexibility, and ease of use—not to mention cost.

The good news is that we finally have reliable ways to print envelopes with computers. If your volume warrants, you'll find that it's not only more convenient and efficient to have a machine dedicated to envelope printing, but it's cheaper, too.

DATATECH INC.

Datatech Scriptomatic DP1185

by Alfred Poor

The Scriptomatic DP1185 address printer from Datatech has the dubious distinction of carrying the highest list price of all the machines tested here: $5,195 including the Postnet bar code option. On the other hand, it gives you much more in the capabilities it offers.

To start, the printer uses standard impact dot matrix technology. Instead of being satisfied with 9-pin resolution, however, Datatech uses a 24-pin printhead for higher-quality output. As a result, the company talks about the two print modes as "near letter quality" for the default and "high resolution" for the better-quality print. (The company also has a 9-pin envelope printer available at lower cost, but this model doesn't yet have the bar code printing capability; it requires a software package to create and send a bitmapped graphic image of the bar code in order to print it.)

FACT FILE

PHOTOGRAPH: PETER NEUMANN

Datatech Scriptomatic DP1185
Datatech Inc., Union Hill and Clipper Rds., West Conshohocken, PA 19428; (800) 523-0320, (215) 825-6205.
List Price: $4,995; Postnet bar code, $200; receiving basket, $75.
Requires: Parallel or serial port.
Dimensions (HWD): 9.5 x 16 x 19.5 in.
Weight: 75 lbs.
In Short: The Scriptomatic DP1185 is a rugged printer based on a 24-pin dot matrix printhead. With a large input capacity, good print quality, and excellent speed, the printer should make short work of long runs.

CIRCLE 402 ON READER SERVICE CARD

You also get a more powerful front panel than what's offered by most printers. There is the familiar on-line button, but there are also dials, counters, and other unusual items. Two dials allow you to set the horizontal and vertical offsets to indicate where the address should print. This is an easier way to place your printing on an envelope than fussing with your mail-list program's output to make sure you've inserted the proper number of spaces before each address in your list. There is even a mode that correctly spaces the bar code below your address block, even when there are no blank lines between them in your data file.

A pair of rotary switches also let you define the number of lines on the envelope so that they eject at the correct point. Further, you can perform some handy feats that most printers only allow from software, such as switching from draft to quality print modes, which you accomplish with combinations of buttons. You can even clear the printer's buffer by pressing front-panel buttons, or repeat the last envelope—these are two handy features when you encounter a problem in your print run. Perhaps the most useful feature, however, is the counter that shows how many envelopes you've printed.

The printer can handle more envelopes than any other printer in this group; the standard input hopper is rated at up to 700 envelopes. An optional drop-basket ($75) simplifies the output side, but the standard tray can still accept a good stack of envelopes before it needs attention.

Unlike one of its competitors, the Datatech printer has an input slot enclosed on both sides. This puts an absolute limit on the width of the envelopes it can handle. The machine is rated for up to 14.5-inch-wide pieces, however, which is more than adequate for the majority of envelopes used by most businesses.

The printer is easy to set up and adjust, though you probably won't get the chance to find out just how easy. Datatech sells through dealers, and most dealers include delivery and setup as part of the deal. The printer comes in two separate pieces that look a bit like toaster ovens; they attach to each other on a long side. One half handles the envelope-feeding chores, while the other does the printing. (Datatech actually sells the printer section alone as a hand-fed single-sheet printer, and it can even be set up to spit the paper back out the same way it came in, but these are less important than its high-volume applications.)

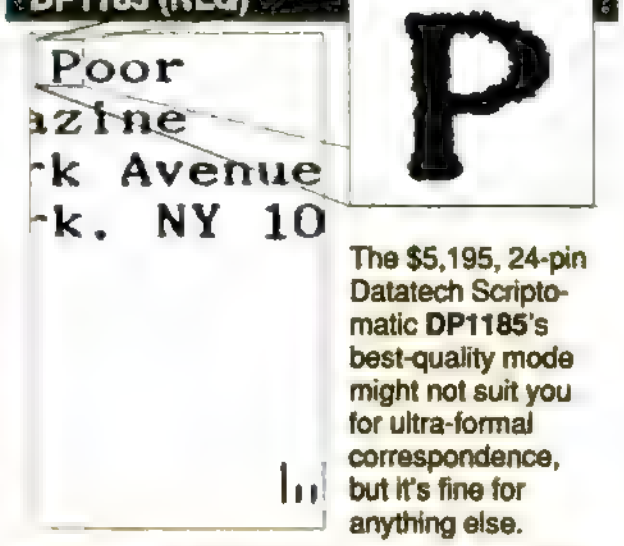
THE PRINT QUALITY OF ENVELOPE PRINTERS

The only essential requirements of any envelope printer's print quality is that it legibly render the address and that it print the Postnet codes dark enough for the Post Office's computers to read. And, of course, good print quality is also necessary for formal correspondence.

Here we've taken print samples from the three envelope printers reviewed and lined them up for easy comparison. For both dot matrix printers (Datatech's Scriptomatic DP1185 and Rena's DA-300), we've shown output in draft and NLQ modes. (The Bryce and Primages machine is a daisy wheel printer and has no draft mode.) Compare relative dot density and overall quality, especially in NLQ. Remember: as long as the NLQ is easily readable, it will do fine for anything except the most formal of letters—and you probably won't be mass mailing those anyway.

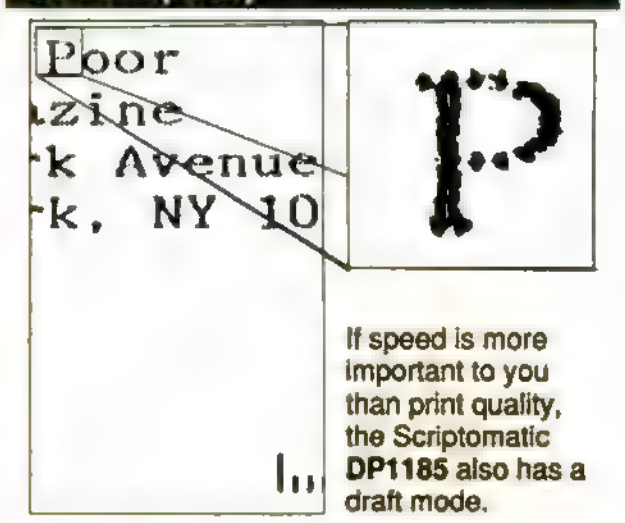
We've also enlarged one letter 500 percent so that you can clearly see the way the printer handles straight lines and if there are too many jagged edges in the curves. Look for little ridges in the curve of the "P"; if you see a lot of them or large white spaces between the dots, that's a bad sign. Make sure the stem is straight with no bleeding.

Datatech Scriptomatic DP1185 (NLQ)



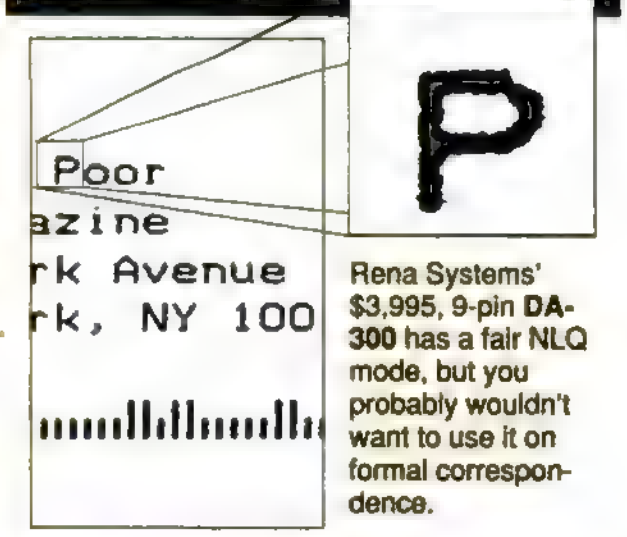
The $5,195, 24-pin Datatech Scriptomatic **DP1185**'s best-quality mode might not suit you for ultra-formal correspondence, but it's fine for anything else.

Datatech Scriptomatic DP1185 (Draft)



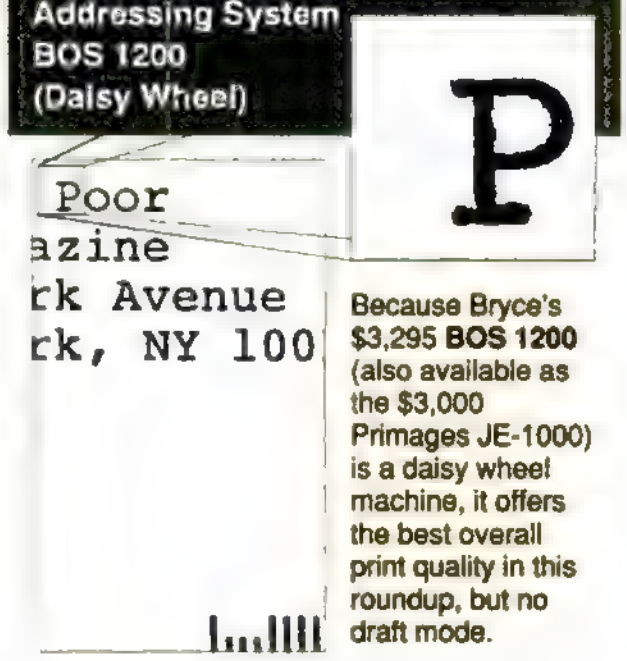
If speed is more important to you than print quality, the Scriptomatic **DP1185** also has a draft mode.

Rena DA-300 (NLQ)



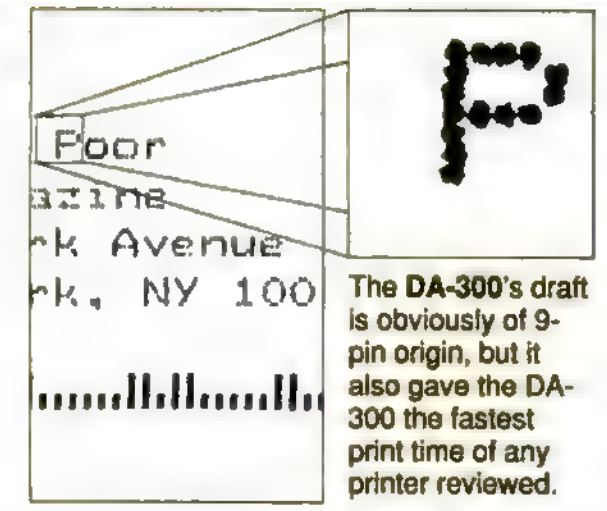
Rena Systems' $3,995, 9-pin **DA-300** has a fair NLQ mode, but you probably wouldn't want to use it on formal correspondence.

Primages JE-1000 Envelope Addressing System BOS 1200 (Daisy Wheel)



Because Bryce's $3,295 **BOS 1200** (also available as the $3,000 Primages JE-1000) is a daisy wheel machine, it offers the best overall print quality in this roundup, but no draft mode.

Rena DA-300 (Draft)



The **DA-300**'s draft is obviously of 9-pin origin, but it also gave the DA-300 the fastest print time of any printer reviewed.

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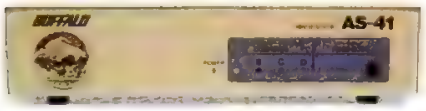

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User Upgradable Memory:
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Input/Output Settings – 4/1 or 3/2:
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Rapid Data Transfer – 100,000 cps:
The HWP uses Direct Memory Access (DMA) for data transfers into the buffer, making the HWP hardware capable of receiving parallel data at the high rate of 100,000 characters per second.

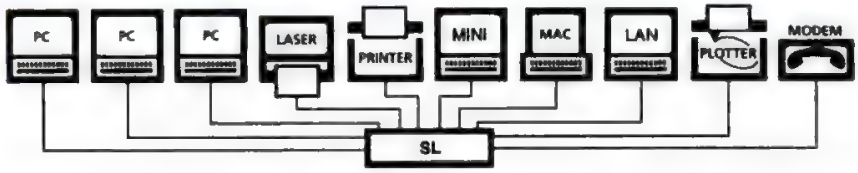
Pop-up Menu or Front Panel Buttons:
Use either the pop-up menu or the front panel switches to select printers, select the next available printer, send multiple copies, clear data, and other functions.

AS-41 — *5 Ports* — *$200*

Smart Switch – No Pop-up or Buffer:
Four parallel inputs to one parallel output, electronic automatic switch with no buffer

SPPS — *(not shown)* — *$100*

Interface Converter – No Buffer
Combination serial-to-parallel, or parallel-to-serial interface converter in a single unit; low-power CMOS design derives power from serial connection, no power supply needed; supports 9,600 to 115,200 bps, DIP switch configurable



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Any Combination of Printers or PCs:
All ten SL or SLP ports can be software configured as either input or output.

Automatically Routes and Buffers Data:
Automatic switching and queuing of jobs; automatically converts data from parallel-to-serial or serial-to-parallel

115,200 bps PC-to-PC File Transfers:
Transfer files serially between PCs up to 115,200 bps; buffer serial data to the SL several times faster than normal 9,600 bps

Pop-up Menu via Hotkeys or Mouse:
Keyboard selection of printers and many other control functions; pop-up is for convenience, but is not required

Simple Installation:
Plug in your cables; if desired, run the installation software for the pop-up menu

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Hooking up to your PC is also a snap, since it comes with both parallel and serial ports as a standard feature.

One place that gets a little tricky is formatting your data output so that it will work with the printer. It accepts a straight ASCII file and can respond to a standard form-feed character (ASCII 12) to eject an envelope. Thanks to the horizontal and vertical position dials, you don't need to fuss with margins in your software. However, the printer does require that you repeat your ZIP code on a separate line after the address. It can find the code without extra lines separating it from the address, but the printer will print much faster if you put two blank lines between them. The printer also needs a software command to convert the second ZIP code into Postnet bar code format. The trigger is a Ctrl-P (ASCII 16) character—it doesn't require a terminating character—so you need to find a way to insert this in your data file. This isn't a problem with a database program like *dBASE*, but may pose difficulties for some dedicated mail-list programs or word processors.

The DP1185 performed flawlessly, never jamming and printing swiftly. We even had to add envelopes in the middle of a run, and it never missed a beat. The printer managed to hit a stride of 2.79 seconds per envelope in the low-quality default mode, nearly as fast as the 9-pin competitors' draft mode but with far better-looking results. The higher-resolution mode slowed the process only slightly, to 3.39 seconds per envelope, while the print was noticeably smoother and darker. The printer manages this feat by still printing each line in a single pass but slowing down the printhead's movement so that the dots overlap more thoroughly. The final result still looks like it came from a dot matrix printer, but it'll suit most people for everything but formal correspondence.

The Scriptomatic DP1185 costs a bit more than its competitors but provides an excellent combination of speed and print quality. The front panel makes some operations easier than any competitor, and the large input capacity should require less attention than the others. This is a serious piece of equipment that's best suited for large-volume applications.

PERFORMANCE TESTS: ENVELOPE PRINTERS

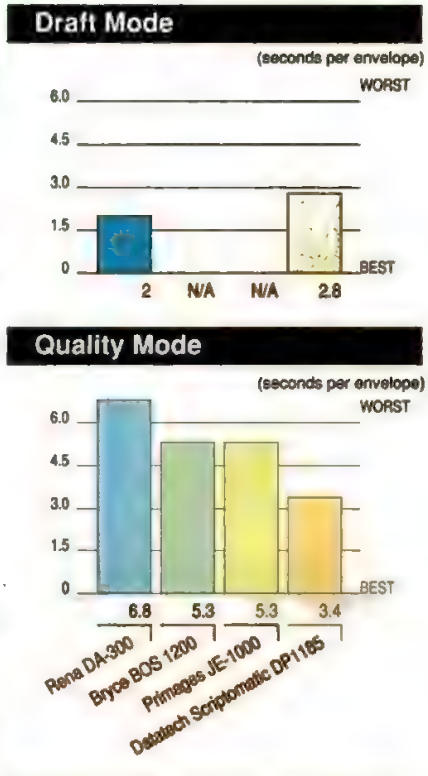
The Rena DA-300 printed the fastest in draft mode, but it crawled behind even the daisy wheels in its best-quality mode. The 24-pin Datatech Scriptomatic had the least difference between draft and NLQ.

To test these printers, we started with a database of 125 names and addresses in ASCII format. The addresses were typical four-line affairs, with name, company, street, and city-state-ZIP information. The ZIP codes were all in Zip+4 format.

We edited this file to match the specific requirements of the various printers. In some cases, this meant adding spaces to the start of the lines; in others it meant repeating the ZIP code information on a separate line with embedded codes to trigger the Postnet bar code printing.

We then ran the text file through each printer using the DOS COPY command, with the printer attached to the parallel port of a Compaq DeskPro 386/25. While the printers were churning through the 125 addresses, we measured the time each machine took to print ten envelopes. Three measurements were taken, then averaged and divided by ten to produce the reported seconds-per-envelope results. Printers using dot matrix print technology were timed twice: once in the fastest or draft print mode, and once in the best-quality mode.

As might be expected, the daisy wheel-based Primages and Bryce printers were slower in comparison with the draft modes of the dot matrix models. On the other hand, the Rena high-quality print was actually slower than the daisy wheels. The Datatech printer slowed the least between draft and high-quality modes.



N/A—Daisy wheel printers do not have a draft mode.

PRIMAGES INC.

JE-1000 Envelope Addressing System

BRYCE OFFICE SYSTEMS INC.

BOS 1200

by Alfred Poor

Here's a big surprise for those of us who have survived the past few *PC Magazine* Printer Projects. We never imagined this magazine would ever print another daisy wheel printer review, but here it is!

This is one printer from two vendors: the JE-1000 from Primages and the BOS 1200 from Bryce Office Systems. The only difference is the list price ($3,000 suggested retail from Primages, and $3,295 from Bryce) but who you buy it from depends in part on what dealers service your area.

Surprisingly, this machine offers some unique advantages when it comes to printing bar codes. Bar codes with a daisy wheel? Bar codes are more often associated with graphics printers, but this printer comes with a special print wheel that carries the two bars required to print Postnet codes. The result is a crisp and clear bar code that prints quickly.

The big dividend you get from this approach is an envelope that looks like it was typed with a typewriter. No matter how "near" you get with "near-letter quality" it's hard to match the impression made by a fully formed type mechanism like a daisy wheel. And Primages' printers have enjoyed a reputation for being the best in their class—in 1986 a Primages printer was one of the last daisy wheels to earn an Editors' Choice. Fast and quiet, this printer is a far cry from the slow clunkers that we tend to think of when we remember the old daisys.

The printer managed to produce the envelopes in our tests with a speed of 5.32 seconds per envelope. While not as fast as the 24-pin dot matrix competitor at its best quality, the Primages/Bryce was faster than the 9-pin machine in its best print mode. And the results were visibly better than either of the dot matrix products.

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Resolution: 300 Dots Per Inch.
RAM: 512K Standard, expandable to 4.5MB.
Interfaces: Centronics Parallel and RS-232C Serial.

The KX-P4420 Panasonic Personal Laser.

Printing Speed: 8 pages per minute.**
Compatibility: HP LaserJet Series II emulation.*
Fonts: 22 Internal Fonts-11 available in both portrait and landscape. Two slots for optional font cards.
Paper Handling: 250-Sheet Cassette with Manual Feed. Face-up and face-down output.
Resolution: 300 Dots Per Inch.
RAM: 512K Standard, expandable to 4.5MB.
Interfaces: Centronics Parallel; Optional RS-232C Serial.

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*HP and LaserJet Series II, Epson, IBM, Diablo, Adobe and PostScript, MS-DOS, UNIX and Appletalk are registered trademarks or trademarks of Hewlett-Packard Co., Seiko Epson Corp., International Business Machines Inc., Xerox Corp., Adobe Systems Inc., Microsoft Corp., AT&T, and Apple Computer Inc., respectively. **Letter size, text mode, 5.5% image area, all originals
[Specifications are subject to change without notice.]

LPF PC

CIRCLE 122 ON READER SERVICE CARD

SEIKO SMART LABEL PRINTER: The Little Labeler

by Alfred Poor

If you don't send enough mail to justify a dedicated envelope printer and don't need to use the Postnet bar codes, but you'd still like something to take the envelope hassle away from your regular printer, there is a solution.

Seiko Instruments USA has created the Smart Label Printer which lists for $250—a compact, stylish device that does nothing but print labels. About 6.3 inches deep and 3.6 inches wide, it takes up no more space than a large paperweight. It's almost 6.2 inches tall, and the top holds a roll of special 2.1- by 3.5-inch adhesive labels—two of these 130-label rolls cost about $10.

PHOTOGRAPH PETER NEUMANN

The tiny $250 Seiko Smart Label Printer can address labels directly from your screen via a hotkey combination.

You will not want to use this machine for long print runs, since it's not particularly fast; printing three-line addresses at the default font settings it managed to produce about five labels per minute.

The Smart Label Printer is more useful for short lists and single labels. All it needs is a serial port on your PC—and it comes with a cable that has both 9-pin and 25-pin connectors. It also comes with a terminate-and-stay-resident (TSR) utility that gives you surprising control over its operation. (Software is also included for the Macintosh.) The program can identify an address block displayed on your screen and will put a box around it when you press the hotkey combination (which can be changed from the default Alt-S combination if you wish.) You can then print a label for that address or switch to a control menu.

The control menu lets you choose between the Serif and Sans Serif fonts, change the size of the type, and select the level of boldness for the text. All text on a label is printed with the same font—you cannot mix them on a single label. Even with all these options, however, the results are rather rough and coarse compared with higher-resolution output devices.

You can also select to print an ASCII file—the Smart Label Printer uses a pair of carriage return/line-feed combinations to signal the end of a label.

Seiko Instruments also includes a device driver. Loaded in your CONFIG.SYS file, the driver makes the printer appear to be an output device. Anything written to the device "SLP1" is printed on the label printer. You can use this within word processing or database programs if the application lets you write data to a file instead of to a printer. Just specify SLP1 as the filename, and the output will print immediately on the Smart Label Printer.

The biggest drawbacks of the Smart Label Printer are its slow speed and the rough quality of the output. On the other hand, it's affordable, in terms of both space and budget. If you need a simple way to get addresses out of your computer and onto envelopes or packages, this might be just what you need. ■

Seiko Smart Label Printer
Seiko Instruments USA Inc., PC Products Division, 1130 Ringwood Court, San Jose, CA 95131; (800) 888-0817, (408) 922-5900. **List Price:** $250. **Requires:** Serial port. **Dimensions (HWD):** 6.2 x 3.6 x 6.3 in. **Weight:** 1 lb.

CIRCLE 406 ON READER SERVICE CARD

The printer is, however, a little short on the capacity side. The feeder is rated at only 100 envelopes, so it requires some extra attention compared with the others. When we fed in a stack of envelopes, the last envelope sometimes misfed, so you need to remember to keep the rollers clean and pay close attention when the stack gets low.

You are also a bit constricted in terms of paper size. The maximum width is only 10 inches, and the envelopes can be no taller than 6.5 inches. Standard Number 10 business envelopes are a piece of cake, but some of the larger envelopes may cause problems.

On the other hand, the printer handles the Postnet bar-code data requirements as elegantly as you can imagine. Unlike other envelope printers, you don't need to send special codes, except for a carriage return

PHOTOGRAPH PETER NEUMANN

JE-1000 Envelope Addressing System
Primages Inc., 151 Trade Zone Dr., Ronkonkoma, NY 11779; (800) 821-0066, (516) 585-8200.
List Price: $3,000; 250-envelope input and output trays, $500.
Requires: Parallel or serial port.
Dimensions (HWD): 17 x 24.5 x 20 in.
Weight: 63 lbs.

CIRCLE 404 ON READER SERVICE CARD

BOS 1200
Bryce Office Systems Inc., 115 Hurley Rd., Oxford, CT 06483; (800) 627-2792, (203) 264-0727.
List Price: $3,295; 250-envelope input and output trays, $595 (if purchased bundled with the printer, $3,695); flat feeder (for 9- x 12-inch envelopes), $1,650.
Requires: Parallel or serial port.
Dimensions (HWD): 17 x 24.5 x 20 in.
Weight: 63 lbs.
In Short: This printer, sold by both Primages and Bryce, uses daisy wheel technology for an exceptional appearance. You give up only a little speed for this quality, though the printers are limited in terms of capacity and paper size. If appearances count, this is your best choice.

CIRCLE 403 ON READER SERVICE CARD

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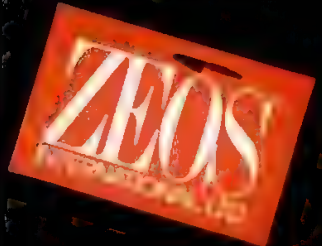

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CIRCLE 388 ON READER SERVICE CARD

at the end to eject the printed envelope. You also need to format the data file to move the address to the right so that it prints in the correct location (or use software commands to adjust the printer's left margin). You don't have to send the ZIP code data twice, however. The printer's controller can extract the data from the address block and automatically use it to print the Postnet bar code at the bottom of the envelope.

The printer is straightforward to set up and operate. The ribbon and print wheel install in much the same way as with most daisy wheel printers. The large envelope-handling mechanism sits on top of the printer and grabs hold of the platen shaft with two hooks. There is a small D-shaped connector that electrically connects the envelope feeder to the printer, and this mates with a corresponding connector on the machine's top. They line up and connect when you get the hooks placed correctly. I found myself doubting that this installation could be so easy, so I ended up repeating the process a few times until I was certain it really was as simple as it appeared.

There are a variety of DIP switches for configuration settings, but the factory defaults were perfect.

The front panel offers a useful set of indicator lights and controls. These allow you to take the print on- and off-line, load and eject envelopes, and monitor the printer's status.

The JE-1000/BOS 1200 (Primages/Bryce) offer excellent print quality at acceptable speed. If your print volume is modest and you want to make the fine impression of an address that appears to be typewritten, then this is the printer to consider.

RENA SYSTEMS INC.

Rena DA-300

by Alfred Poor

What *is* that? It doesn't look like any piece of computer equipment I've ever seen! Well, it's a Rena DA-300 envelope printer with a list price of $3,995, and it sure doesn't look like a printer.

Most printers have a self-contained paper path, with two fixed edges on either side. This traditional design has been used on office machines back through the early days of typewriters. The Rena DA-300 takes envelope handling a step further: There is no edge on one side, and the paper path is marked by an open slot.

This open design has a major advantage over competitors; there is no limit to the width of envelope that it can handle, since the excess simply sticks out the side. Of course, the USPS sets limits for the size of envelopes they will handle, but that's the only practical limitation for this machine.

The printer uses impact dot-matrix technology, with a heavy-duty 9-pin printhead performing the work. In draft mode, the print quality is fair at best—it looks like typical 9-pin dot-matrix draft print. On the other hand, the printer offers a higher-density mode which Rena refers to as "near-laser quality." This NLQ mode, although far better than the draft mode, is still obviously the product of a dot matrix printer, and some people might decide it is not formal enough for some correspondence.

The printer is fast in draft mode; it required only 2.42 seconds per envelope in our tests. The next-fastest printer was the Datatech, but that was 15 percent slower in its draft mode than the Rena. The Rena loses its speed advantage, however, when you shift into NLQ mode. The time per envelope ballooned to 6.8 seconds—almost three times slower than draft mode, and 28 percent slower than the daisy wheel Primages printer. The printhead relies on multiple passes to achieve its high-quality print, and this process is accompanied by a heavy penalty when it comes to speed.

The Rena DA-300 is extremely compact and easy to set up. At 31 pounds, it's less than a third the weight of its competitors. The most difficult part of the setup process was removing the plexiglass dust cover from the print area so that the ribbon cartridge could be installed.

The paper handling is a snap to adjust. The printer comes with two edge guides to accommodate different widths of envelopes. The standard input hopper is rated at 150 pieces, and an optional $117 hopper extends this to 350-piece capacity. The only other option is a serial port ($388) in case you cannot make use of the standard parallel connection.

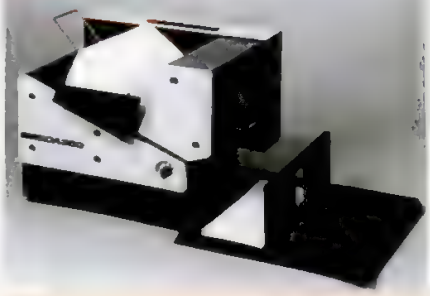
The DA-300 has an eight-key front panel with indicator lights. You can put the printer on- or off-line, eject or load paper, initiate a self test, and make tiny adjustments in the paper position so that you can alter the print location of the address. The printer also has the ability to print "upside down;" you can reverse the printing to feed envelopes backwards.

The printer requires just slightly more formatting of your data file than the others reviewed here. You need to repeat the ZIP code and separate it from the address block by a pair of blank lines. You also need to send a form-feed character to eject the envelope. A Ctrl-P character must be inserted both before and after the second ZIP code—this triggers the printer into producing the Postnet bar code. While these requirements are not as convenient as the competing designs, it's a fairly simple task to format appropriate output from most database programs.

Your decision about the Rena DA-300 will most likely be governed by what you are or are not attracted to. The dot matrix output may be too coarse for some applications. On the other hand, its high speed and flexible paper handling give it some clear advantages over the other products. If this combination of features is what you need most, this printer looks ready for the long run. ■

Alfred Poor is a contributing editor of PC Magazine.

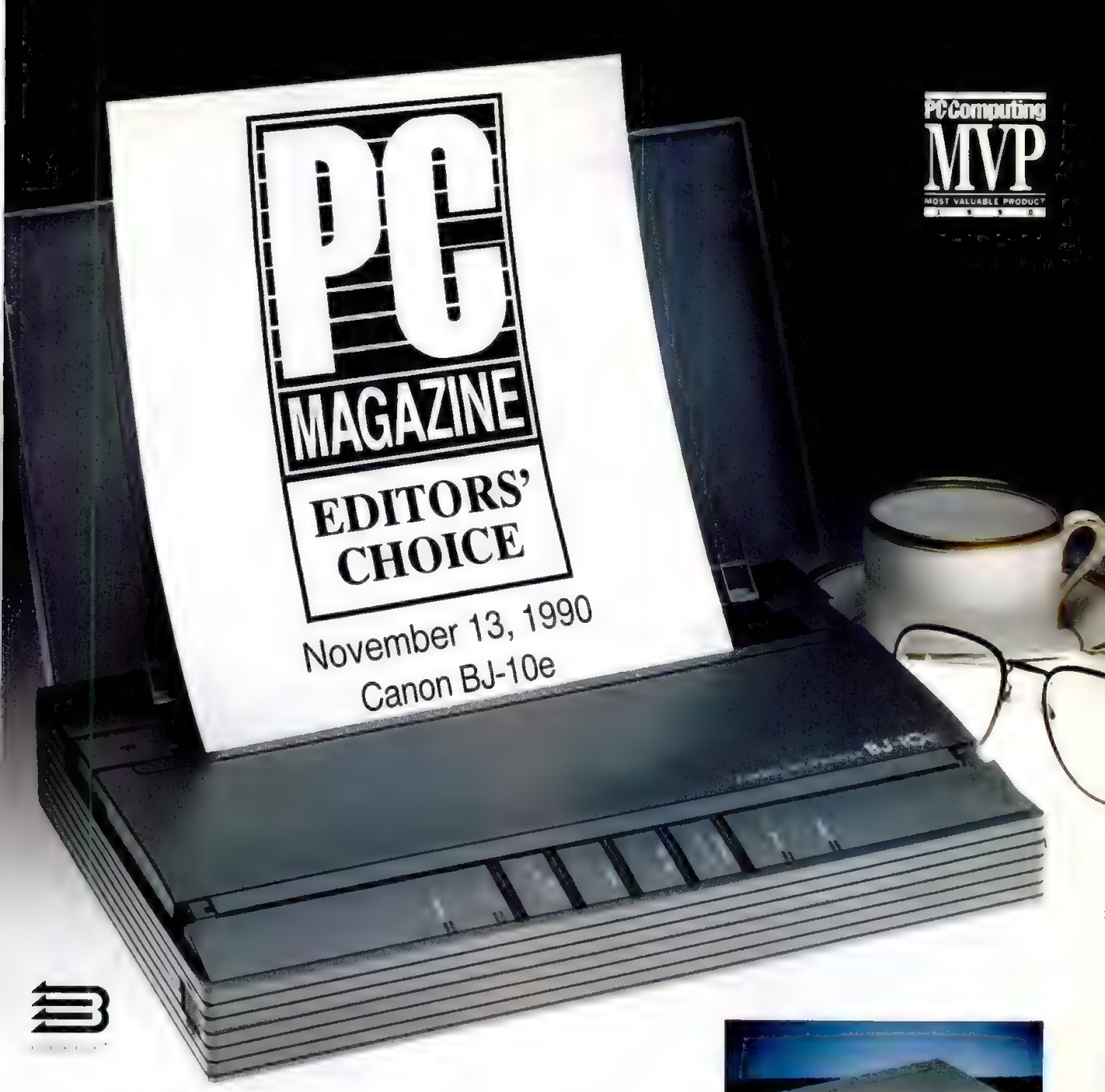
FACT FILE



PHOTOGRAPH: PETER NEUMANN

Rena DA-300
Rena Systems Inc., 290 Hansen Access Rd., King of Prussia, PA 19406-2429; (800) 426-7905, (215) 265-8420.
List Price: $3,995; optional extended copy hopper, $117; serial interface, $388.
Requires: Parallel or serial port.
Dimensions (HWD): 11.5 x 12.3 x 29.3 in.
Weight: 31 lbs.
In Short: The Rena DA-300, though the fastest machine tested here, featured less-than-perfect 9-pin print quality. However, it's small, rugged, and offers the most flexible paper handling, so if you don't need typeset-quality addresses, this could be the one for you.

CIRCLE 405 ON READER SERVICE CARD



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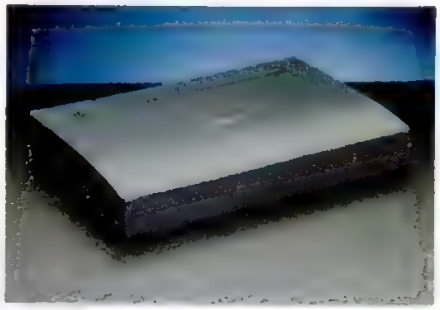

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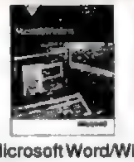

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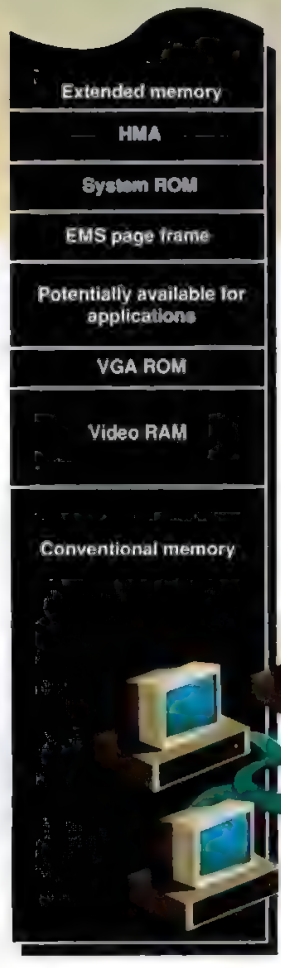


Networking software takes a toll on workstation memory and can prevent you from running your favorite programs. PC LAN Labs reviews five memory management packages that relieve LAN RAM cram.

by Frank J. Derfler, Jr., M. Keith Thompson, and R. Dennis Boatner

"Why can't we run all of the programs that we did before we installed the LAN?" This question has been asked of every LAN administrator, and the answer has to do with the memory that is stolen from client PCs by networking software. The best solution to this problem: LAN memory management software.

To help you find the most efficient way to cope with RAM shortages on client PCs, PC LAN Labs evaluates five network memory management products: *AboveLAN*, *LANSpace*, *NetRoom*, *QEMM-386*, and *386MAX*. Some carry a per-user price tag from about $100 to $130, while others offer multiuser licenses; *NetRoom*'s $149 price for four users is a steal. And some products sell at a per-server price of about $500—a bargain for many organizations.

Our evaluation has uncovered some important caveats. Since practically every PC is different, consistent results from memory-saving efforts for all of the PCs in your organization should not be expected. In addition, memory management concepts and techniques are tricky. In two separate instances, the tested memory managers actually took more memory away from applications than they saved. Finally, just because your network drivers use up 60K or more RAM, you shouldn't anticipate getting it back when you put the networking software into memory located outside of the 640K DOS boundary. You're more likely to gain only 18K to 36K for your efforts.

IT ALL ADDS UP

There's no way around it: Networking software in client PCs takes up memory. Some companies, like Artisoft, have worked to reduce the amount of memory their programs use by writing them in assembler language to make the executable files smaller and by loading sections of the software into the adapter card. Client PCs working under Artisoft's *LANtastic* give up only 8K to 13K of memory to the network.

The more complex the network operating system, the more RAM it uses. You can lose at least 100K RAM from the DOS program area to the network redirector, transport layer software, and application program interfaces on Novell and Banyan networks.

Regardless of the amount of money you spend on memory chips, DOS still only recognizes 736K RAM—640K if you want to use graphics. This is called the conventional memory area. Every memory management technique must work with and around DOS conventional memory.

All PCs can accept conventional memory up to the 640K limit. Ten years ago, the designers of IBM's first PC reserved the memory range from 640K to 1MB (high-DOS) for adapter cards. Most adapter cards you install—everything from mouse adapters to video and network interface cards—need a memory location to communicate with the CPU, and they normally use space in the reserved high-DOS area. For example, a VGA video adapter in an AT-class machine can use 160K or more of high-DOS memory for its memory-to-memory interface. (See the diagram "A Typical Memory Map" for an illustration.)

80286-based computers can accommodate 15MB of extended memory, in addition to the 1MB of conventional and high-DOS memory. The extended memory is only accessible when 80286 processors operate in protected mode with operating systems such as OS/2, *Advanced NetWare 286*, Version 2.15, and Unix. Since MS-DOS runs all processors in "real mode" for software compatibility reasons, the processors can't get access to the extended memory.

In the early days of the AT, users configured extended memory as a RAM disk. A clever programmer found a way to switch a processor under the control of DOS from real mode to protected mode and then back. The first program to use this technique was DOS 3.0's VDISK.SYS.

The newer 386SX-, 386-, and 486-based machines offer all the capabilities of the 286. The latter two processors also have 32-bit addressing, allowing them to handle up to 4GB of RAM. Despite the chips' capabilities, the operating systems can't use all this RAM. Until the 32-bit version of OS/2 is ready, the processors'

LAN MEMORY: Defining the Terms

Backfilling A process that associates expanded memory with addresses in conventional and high-DOS memory. Backfilling makes high-DOS memory available to application programs.

Conventional memory Base memory in the range from 0K to 640K. Most normal programs and TSRs reside in this area.

EEMS Enhanced Expanded Memory Specification—a superset of the original LIM 3.2 specifications. This specification was developed by AST Research, Quadram, and Ashton-Tate and was replaced by the current LIM 4.0 standard.

EMM Expanded Memory Manager. This software allows access to expanded memory. EMMs usually set up and configure memory for applications such as *Adobe Illustrator* or *Microsoft Windows* 3.0.

Expanded memory Memory accessed using LIM EMS standards. Not directly addressable, expanded memory is mapped to conventional memory as needed. Memory management software and hardware device drivers address expanded memory.

Extended memory Memory in 80286, 80386-, and 80486-based systems located above the 1MB address limit. Extra memory on these machines defaults to extended memory, which cannot be accessed directly from MS-DOS. Some memory management programs convert extended memory to expanded memory and map it into extra high-DOS memory.

High-DOS memory Address space between 640K and 1MB RAM. You need LIM 4.0 in order to access this area. Certain other things, such as the type of video card and LAN adapter, determine the amount of high-DOS available.

HMA High Memory Area. The first 64K of extended memory defined by the Extended Memory Specification (XMS). High memory is unique since you can execute code while in real mode. Device drivers such as HIMEM.SYS provide access to HMA.

HIMEM.SYS An extended memory manager from Microsoft. This DOS device driver allows programs to use extended memory (specifically, the HMA area of extended memory) in a standard and consistent manner.

LIM Lotus/Intel/Microsoft Expanded Memory Specification—also known as EMS (Expanded Memory Specification) or LIM EMS. A standard defining expanded memory, the current LIM standard is LIM 4.0. Most memory boards support LIM 3.2 and include software to handle LIM 4.0.

XMS Extended Memory Specification. XMS adds 64K to the DOS's conventional 640K. Directly accessible from DOS, XMS is a spec jointly developed by AST Research, Intel, Lotus Development, and Microsoft. ■

huge memory capabilities won't benefit users unless they use another 32-bit operating system such as Unix.

CONFUSED TERMINOLOGY

Functionally, a PC offers three types of random access memory: conventional, extended, and expanded. The processor and software use each type of memory in a different way, although the RAM chips remain the same.

Different terms apply to specific locations of memory, as well. Unfortunately, several companies use similar terms to refer to different memory areas. Quarterdeck Office Systems, for example, calls the memory between conventional memory and 1MB "high memory." Other vendors call the section just above 1MB the "high-memory area." Helix Software defines the section between conventional memory and 1MB as "high-DOS memory." We adopted that term because it's technically accurate and conflicts the least with accepted names for other parts of memory.

Regardless of the name you attach to the memory located above conventional RAM, the key to getting as much room as possible for applications that must run in DOS's 640K is to load as many drivers, network programs, data blocks, and terminate-and-stay resident (TSR) programs into the RAM outside of conventional memory. Programs loaded into high-DOS can run with practically no degradation in performance. Memory managers using other techniques, particularly loading into expanded memory, can slow down performance of the programs they move from conventional RAM.

ALL MEMORY IS NOT CREATED EQUAL

Now it's time for the alphabet soup. If you really want to understand memory management software, you need to learn the names and backgrounds of some important concepts. For an even more detailed explanation of computer memory operation and terminology, see "How to Get the Most From Your System's High DOS Memory," (*PC Magazine*, May 29, 1990).

In 1987, 80286-based PCs got the ability to use a 64K block of memory above the 1MB barrier. Contrary to popular belief, it wasn't Microsoft that discovered the way to use this high-memory area (HMA). Quarterdeck Office Systems, the makers of *DESQview*, first discovered the trick by turning off the A20 line on the 80286. When this control line is off, the CPU does not force a memory ceiling, allowing programmers to load part of their code in this 64K area. Quarterdeck's driver, QEXT.SYS, equivalent to Microsoft's HIMEM.SYS, permits specifically written programs to load into this section of memory, leaving an extra 64K of conventional memory available for other uses.

Now many other companies provide products that use HMA by following a procedure called the *Extended Memory Specification (XMS)*. Version 2.0 of XMS was developed by Lotus, Intel, AST, and Microsoft. Again, companies and writers are not consistent. You'll see this area of memory called both the HMA and the XMS memory.

> The key to getting as much room as possible for applications is to load drivers, network programs, data blocks, and TSRs into RAM outside of conventional memory.

To really confuse things, "extend" is reused to define a related type of program called a *DOS extender*. Applications like *Lotus 1-2-3*, Release 2.2, and *Windows* 3.0 use DOS extender programs to run in extended memory. DOS extender programs work in the same way as the original DOS 3.0 VDISK program, moving the processor in and out of protected mode in order to use the extended memory. Application programs must be written specifically to use the DOS extenders; otherwise, they don't have access to this memory.

Sections of the high-DOS memory area are available to run programs under a scheme called the Expanded Memory Specification (EMS). All IBM-type PCs normally reserve high-DOS for devices such as video cards, LAN adapters and hard disk controllers. But if a PC isn't configured with adapters using this space, some of the products in this review let you load network drivers, such as Novell's IPX.COM and NET3.COM/NET4.COM, into the high-DOS area. In order to use this type of memory on an 286-based machine, you must have a memory card and interface software that complies with EMS. Also, 386SX-, 386-, and 486-based computers provide the hardware necessary to turn extended memory into EMS memory.

In 1985, Lotus, Intel, and Microsoft created this EMS expansion technique, which is why it's known as *LIM EMS*. The specification allows EMS-compliant programs, working with EMS-compliant hardware, to put data into memory above 1MB and then to overlay or map it into the high-DOS memory area as needed. Originally, the three companies designed EMS primarily to store data from spreadsheets. AST, Quadram, and Ashton-Tate, recognizing the limitations of EMS and feeling the pinch of competition, developed what they called the *Extended Expanded Memory Specification (EEMS)* four months later. In 1987, pushed by Intel's need to integrate the 80386 processor into the LIM EMS model, the LIM team enhanced the original EMS to include a larger page-mapping ability, similar to that of EEMS, naming it *LIM EMS 4.0*.

The original LIM EMS specification allowed remapping of only a 64K chunk of memory. LIM EMS 4.0 lets programs swap the entire 1MB address range containing conventional and high-DOS memory in and out with data contained in the special LIM EMS 4.0 memory. In prac-

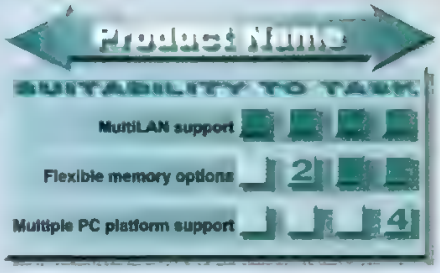
EDITORS' CHOICE

- **NetRoom, Version 1.10**

The most flexible product we tested, Helix Software's *NetRoom*, Version 1.10, lets you load the IPX and NET3/NET4 files into high-DOS, in addition to swapping them out if another program needs to access it. *NetRoom*'s Discover program makes installation a pleasure by automatically modifying your AUTOEXEC.BAT and CONFIG.SYS files with its built-in editor. With its versatility, this $149 four-user version rates as a real winner. Considering *NetRoom*'s price and capabilities, you'll find that there is no second choice for LAN memory management software.

LAN MEMORY MANAGEMENT SOFTWARE: SUITABILITY TO TASK

Memory management software for client workstations should allow the LAN administrator as much flexibility as possible for configuring the software throughout the network. Today's networks often connect various PC platforms and different network operating system brands. Since many networked PCs access specific areas of memory better than others, the software's ability to work with diverse memory areas also plays an important role.



THE TASKS

PC Magazine has assessed and assigned a point value to LAN management software's suitability in three areas. These informed subjective ratings, based on a scale from 0 to 4, are presented along with each review. Compare them with the product reviews, the features table, and the benchmark test results for a complete picture of what each product offers.

MultiLAN Support indicates the package's ability to let managers use a single memory management product in a multivendor network environment. High-scoring products work with various network operating systems.

Flexible Memory Options rates the package's flexibility in making conventional memory available to DOS programs. To score well, a product must offer different options for memory management. This flexibility includes the ability to load network drivers into high-DOS, HMA, and EMS memory.

Multiple PC Platform Support rates how well the package allows the manager to use one memory management package on all PCs, ranging from XT to 486 class, equipped with different hard disk controllers and video adapters.

THE RATINGS

0—lacks feature or is not at all suited
1—poorly suited
2—has some capability
3—well-suited
4—ideal for the task

tice, however, not all memory boards compatible with LIM EMS 4.0 can really handle this action.

Programs can access EMS memory only through a special region called a page frame. This page frame typically occupies 64K in the high-DOS memory area. The software driver included with your EMS memory card manages the memory by swapping the requested RAM from a holding pool of expanded memory to the page frame for DOS applications to use. Several memory managers in this roundup, including *QEMM-386*, *NetRoom*, and *386MAX*, can move the page frame into conventional memory or even into otherwise forbidden areas such as space reserved for—but unused by—some versions of the ROM BIOS.

The other main use of EMS 4.0 memory is to fill in the unused sections of the high-DOS memory area. After remapping this area, special "loadhi" programs can load and execute most DOS programs or drivers in this memory. *QEMM*, *386MAX*, and *NetRoom* are examples of programs that use this technique.

However, modern PCs often don't have a lot of free room in high-DOS. Differences between video boards and specific versions of drivers for mouse, memory, fax, LAN, and other adapters makes trying to use the high-DOS and HMA areas a different challenge on each PC. On some PCs, the combination of ROM BIOS, video adapter interface, and a 64K page frame makes it impossible to move any other useful blocks of software from conventional memory out of the way into the high-DOS memory area.

One way to understand how these memory configurations work is to use either of two excellent utilities: *Discover* from Helix Software or *Manifest* from Quarterdeck Office Systems. Both utilities are shipped with the memory management products made by these companies. They provide an excellent real-time view of the memory configuration and possibilities available within a PC.

LOSING RAM BY BITS AND PIECES

Because of *NetWare*'s popularity, its drivers seem like the hungriest network programs, devouring a workstation's conventional memory. But other network management packages, such as Banyan *VINES* and Microsoft *LAN Manager*, include similar (and sometimes even larger) redirector and driver software modules.

The *NetWare* software, while essential, still exacts a heavy toll. Novell's IPX program informs the network of the presence of a network adapter card, the transfer protocol to use, and the corresponding hexadecimal address and interrupt channel of the network card. You must load this file before you can log onto the network. It takes up 17K of RAM.

Because of its popularity, *NetWare*'s drivers seem the hungriest for RAM, but other LAN operating systems are similar.

A Novell program generically called the *NetWare* shell and named NET2, NET3, or NET4 redirects requests from application programs to network servers. The name of the program you use varies with the version of DOS you run. The shell grabs 35K of RAM, so between the IPX and the shell, you lose 52K of conventional RAM. Keep in mind that this total doesn't include loading COMMAND.COM, any drivers in the CONFIG.SYS file, or programs in the AUTOEXEC.BAT file. By the time you load extra buffers allocated for network operation and a few other typical drivers, files, and TSRs, it's not unusual to be left with less than 500K for standard DOS programs.

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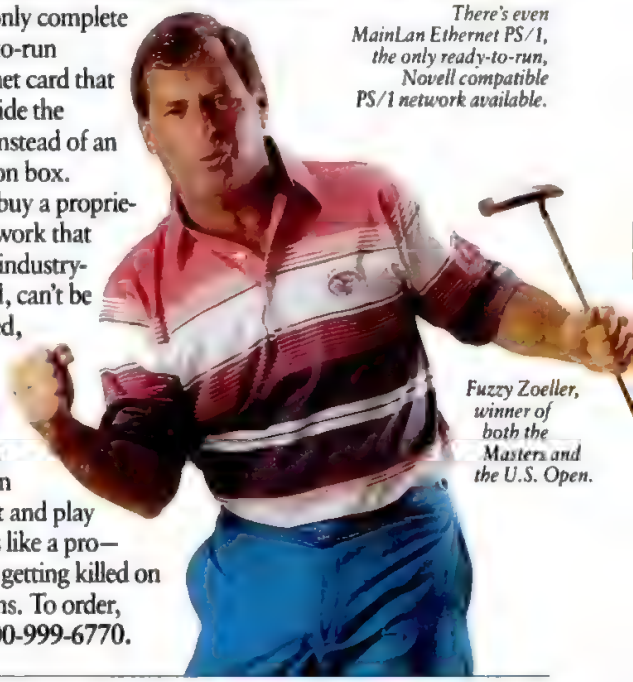

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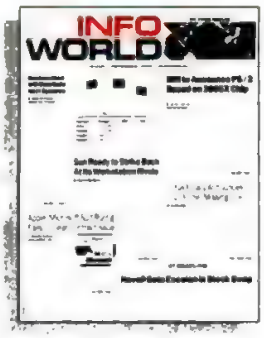

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CIRCLE 735 ON READER SERVICE CARD

Microsoft's upcoming MS-DOS, Version 5.0, will be able to run from the HMA to give more space to applications in conventional memory. MS-DOS 5.0 also reportedly will allow loading TSRs and drivers into areas above conventional memory. Some products in this review will need to adopt some new tricks to survive, if and when MS-DOS 5.0 comes into common use later on this year.

In addition, in mid-1990 Novell released Version 3.01 of the *NetWare* shell with two variations for loading into expanded or extended memory. If the client PC contains expanded memory and a LIM EMS 4.0 driver, then you can use a shell named EMSNET3.EXE with DOS 3.*x*. If the client PC has an XMS 2.0 memory driver installed, then you use a shell named XMSNET3.EXE with DOS 3.*x*. These new shells save 23K to 30K of conventional memory, but IPX still takes space in conventional memory. You need to use *QEMM-386*, *NetRoom*, or *386MAX* to load IPX high.

OUR EXAMINATION

All of the products we reviewed worked effectively for the specific task of moving the network redirector out of conventional memory on a AT-compatible or 386 machine with 2MB of total memory, an ST506 hard disk controller, EGA or standard VGA, and a network adapter. But many people use PCs configured with much more complexity. Our primary testing machine was an NCR PC486/MC33 Micro Channel model with a 486 processor, 4 MB RAM, a bus-mastering SCSI disk controller, a 3Com EtherLink/MC Ethernet adapter, an Attachmate Advanced 3270 Adapter/2, and a Micro Channel SDLC adapter that connects to a mainframe.

While relatively few people currently use a 486/33 on their desks, the processor makes no difference in this evaluation. Readers with any 386- or 486-based computer can use the memory areas described. Aside from the processor, our test machine did not have an unusual configuration for a corporate PC.

Memory management programs that tried to put the network modules into high-DOS experienced particular problems handling the crowded conditions. Programs that use extended memory, like *LANSpace* and *AboveLAN*, worked well in this PC. *NetRoom* offers many options and even found an innovative, although somewhat risky, way to use high-DOS memory.

REVIEW CRITERIA

We did not evaluate powerful multitasking operating environments such as *Microsoft Windows* 3.0 or *DESQview 386*, which were recently reviewed in *PC Magazine* ("Making DOS Work Overtime," October 16, 1990). Some of these environments, such as *Windows* 3.0, include their own memory management capabilities. Others, like *DESQview*, rely on products in this review to free up space.

We received one product from All Computers, called *All Charge 386*, near the end of our testing cycle and couldn't make it work with the SCSI adapter on our NCR Micro Channel PC before the editorial deadline. This $99 package offers drivers for HMA and LIM EMS 4.0 and works with a wide variety of network operating systems.

We also did not include Bloc Publishing's *PopDrop Plus* because its memory management features focus on manually sequencing the operation of TSRs instead of moving drivers to high memory. Although *PopDrop* 2.0 includes Above Software's *Above Disc* 4.0 to provide some automatic memory management capabilities, *AboveLAN* supplies a more network-specific solution.

Memory management software isn't any fun. It's complex and cranky stuff that can contribute to failures when you run specific combinations of programs. However, a LAN memory management program is an important tool for any network manager who wants to provide the maximum amount of conventional memory to PC client stations.

AboveLAN

by Frank J. Derfler, Jr., and R. Dennis Boatner

Above Software's *AboveLAN*, Version 1.0B, a new LAN memory management tool for network administrators, also comes in a single-user version compatible with almost any class of PC. *AboveLAN* sells for $495 per file server, or you can purchase a single-user version, which comes bundled with *Above Disc*, for $119. Both packages work with Novell's *NetWare*, Version 2.0 or later, and let you load your NET3/NET4 files into extended memory without requiring expanded memory hardware. They also make it easier to run Novell's NetBIOS emulator. And as a bonus, the *Above Disc* package includes a *Lotus 1-2-3* add-in memory manager.

If you use a 286, 386, or PS/2, *AboveLAN* allows you to pick up an additional 36.7K of conventional memory. For those who use the NetBIOS emulation on a Novell network, *AboveLAN* includes a set of programs to load and unload NetBIOS without rebooting the PC. *AboveLAN*'s Above640 program allows you to increase your conventional memory by 96K on systems that contain an EGA or VGA video adapter.

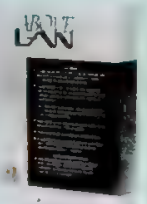
HASSLE-FREE INSTALLATION

The simple menu-driven interface makes installation a breeze. It configures your system based on your responses to a series of questions. During installation, you must specify the directory where your Novell IPX and NET3/NET4 files reside. *AboveLAN* then modifies the client PC's AUTOEXEC file by replacing the NET3 or NET4 program with the ABOVELAN .EXE program. Once it's successfully loaded, a screen appears showing the amount of extended memory used and the amount of conventional memory available for other programs.

AboveLAN worked easily for us. We detected no degradation in the network throughput tests when *AboveLAN* loaded NET3 into extended memory.

When you purchase *AboveLAN* with *Above Disc*, you receive several additional memory management utilities. Above

FACT FILE



AboveLAN,
Version 1.0B
Above Software, 2698 White Rd., #200, Irvine, CA 92714; (800) 344-0116, (714) 851-2283.
List Price: $495 per file server; single-user version (included in *Above Disc* package), $119.
Requires: 256K RAM, 64K extended memory, DOS 3.1 or later; network version: Novell's *NetWare*, Version 2.10 or later.
In Short: *AboveLAN* gives you back about 37K of conventional memory by loading the *NetWare* shell into extended memory. EGA and VGA users can get up to 96K back. It worked flawlessly and didn't slow down network throughput.

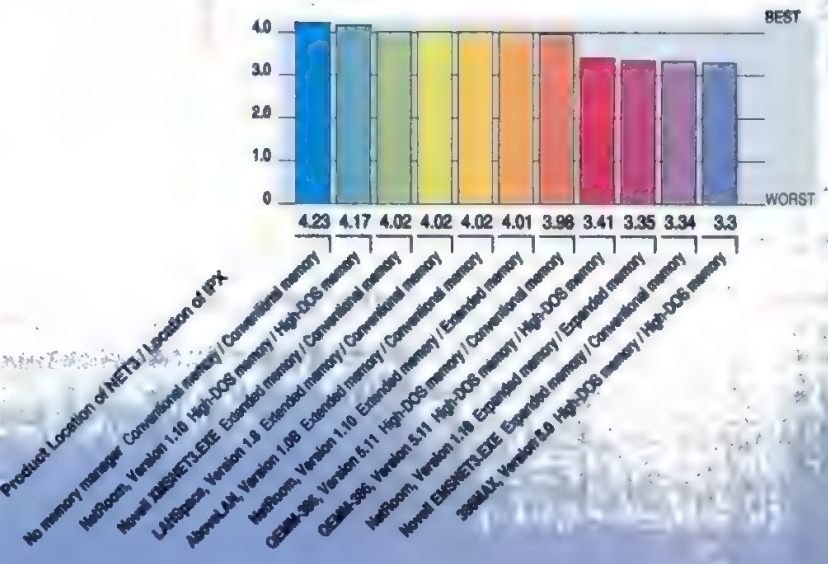
CIRCLE 612 ON READER SERVICE CARD

BENCHMARK TESTS: LAN MEMORY MANAGEMENT SOFTWARE

Since current versions of DOS are optimized to work in conventional memory, keeping Novell's NET3 and IPX files in conventional memory produces the best throughput. However, placing them in extended memory slows throughput only slightly. You pay as much as a 20 percent throughput penalty when you install NET3.COM in expanded memory. *NetRoom*'s placement of the files in high-DOS memory produced throughput closest to that of conventional memory, but this result can't be applied to other memory managers.

We tested the LAN memory management software on a 33-MHz, 486-based NCR PC486/MC33 Micro Channel workstation equipped with 4MB RAM, a 3Com EtherLink/MC adapter, a bus-mastering SCSI disk controller, and an Attachmate Advanced 3270 Adapter/2 (a Micro Channel SDLC adapter that connects to a mainframe). The file server was a fast Samsung 386A3 with a caching hard disk controller and *NetWare 386*, Version 3.1, installed. No other activity took place on the server during the testing period.

Workstation Throughput (megabits per second)



This chart shows the throughput measured on the workstation when we used memory management products to load Novell's NET3.COM shell and the IPX.COM driver in different types of memory, depending on each product's capabilities. (The test results for XMSNET3.EXE and EMSNET3.EXE indicate throughput scores when these programs were used in place of NET3.COM.) The line labeled "No memory manager" shows the throughput measurement when the network programs are loaded normally into conventional memory.

NetRoom uses a technique to place the shell and driver in high-DOS; however, it might not work on all PCs. In this case it worked spectacularly, and placing the *NetWare* shell in extended memory is a good solution overall. You can do this with a memory manager or use Novell's new shell, XMSNET3.EXE, which can load itself there. Only a tiny degradation in throughput occurred when *NetRoom* placed the IPX.COM driver in extended memory.

Using LIM EMS 4.0 expanded memory as a location for the network shell or driver slowed throughput even more—even when we used Novell's EMSNET3.EXE shell instead of NET3.COM. Working through the EMS page frame is not as efficient as addressing the drivers in conventional memory or using the HMA.

The **Workstation Throughput** test, written in Microsoft C, reads and writes a 1MB file 15 times, both sequentially and randomly, on a client workstation using 512-byte, 4K, and 16K data blocks.

Software includes the ASI (Above System Information) program that displays your system and memory information. EMS-

CHECK checks the amount of expanded or extended memory that's available and remappable. AboveMEM works as a *Lotus 1-2-3* add-in for converting extended memory to usable expanded memory.

NO HARDWARE REQUIRED

Above Disc works on 80286, 80386, and 80486 systems. It helps break the 640K DOS barrier without requiring the purchase of special LIM EMS or EEMS memory boards.

Above Software offers a 90-day warranty for defects in disk media. It also provides unlimited technical support at a toll number during the hours of 7:30 A.M. to 5 P.M. PST. Since it mainly works with extended memory, *AboveLAN* offers only a partial solution for handling the RAM crunch on your PC workstations. But gaining 36.7K on each PC, at a reasonable price with no throughput degradation, isn't a bad deal.

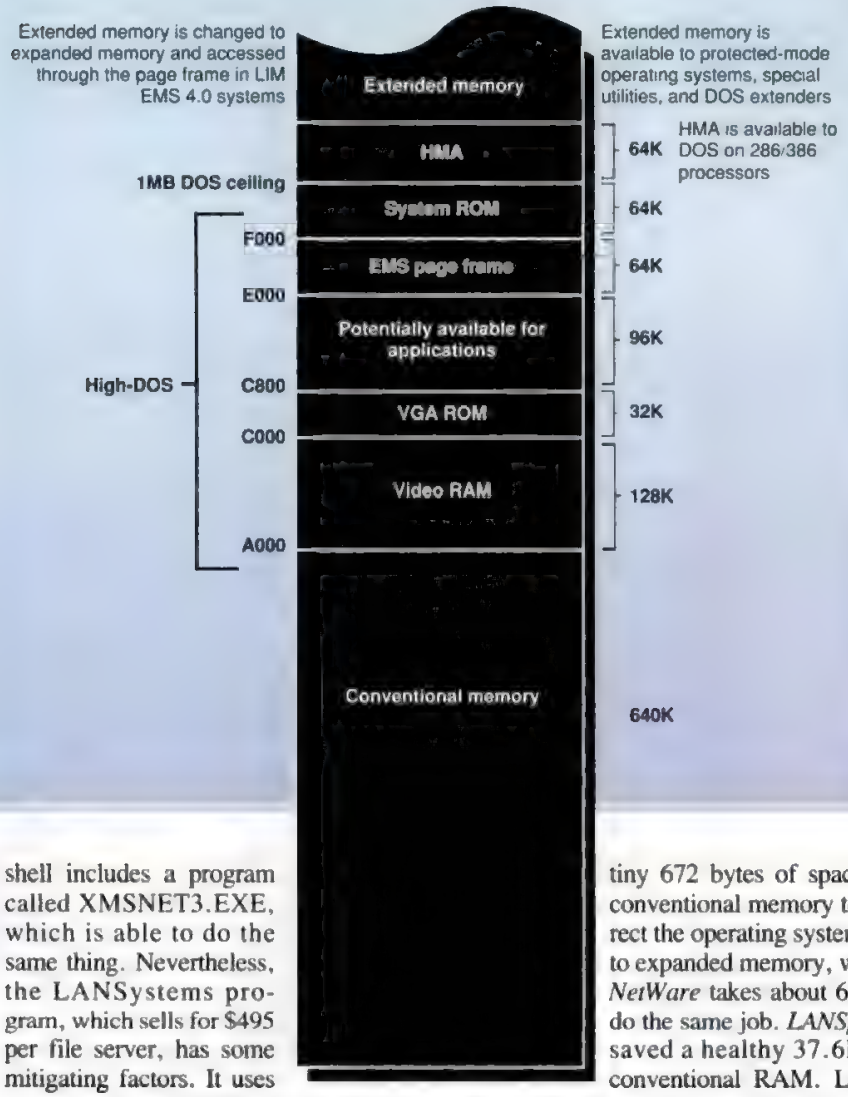
LANSpace

by Frank J. Derfler, Jr., and R. Dennis Boatner

LANSpace, Version 1.8, has a problem. Novell has included most of the product's capabilities in the latest release of the *NetWare* shell. The program did have the useful capability of placing the *NetWare* shell, NET3/NET4, in extended memory. However, Version 3.01 of the *NetWare*

A TYPICAL MEMORY MAP

This diagram illustrates the relationship between the different functional memory types and their locations. Not all PCs follow this memory map exactly—in particular, the size and location of the **video ROM** and **video RAM** in high-DOS is different in many systems. The **High Memory Area (HMA)** is available to special programs following the XMS specification on 80286 and newer processors. DOS extenders, *Microsoft Windows* 3.0, OS/2, Unix, and other environments that use processors in the protected mode can access **extended memory** directly. Special hardware capabilities, available on memory boards conforming to the LIM EMS 4.0 specification and computers with 80386 processors, can change extended memory into a pool of expanded memory. Programs can then access expanded memory through the **EMS page frame** in the high-DOS area.



shell includes a program called XMSNET3.EXE, which is able to do the same thing. Nevertheless, the LANSystems program, which sells for $495 per file server, has some mitigating factors. It uses less space than *NetWare*'s shell, works comfortably with other memory managers, and it makes Novell's NetBIOS emulation program more convenient to load. Users should note that once they install *LANSpace*, they must register within 30 days.

In comparison with *NetWare*'s built-in memory management, *LANSpace* uses a tiny 672 bytes of space in conventional memory to direct the operating system up to expanded memory, while *NetWare* takes about 6K to do the same job. *LANSpace* saved a healthy 37.6K of conventional RAM. LANSystems' representatives say they expect to have a version capable of loading IPX into high-DOS by the time you read this review—Novell still doesn't provide a way to do that.

AUTOMATIC UPDATES

LANSpace loads Novell's NET3/NET4 shell file into the first 64K of extended

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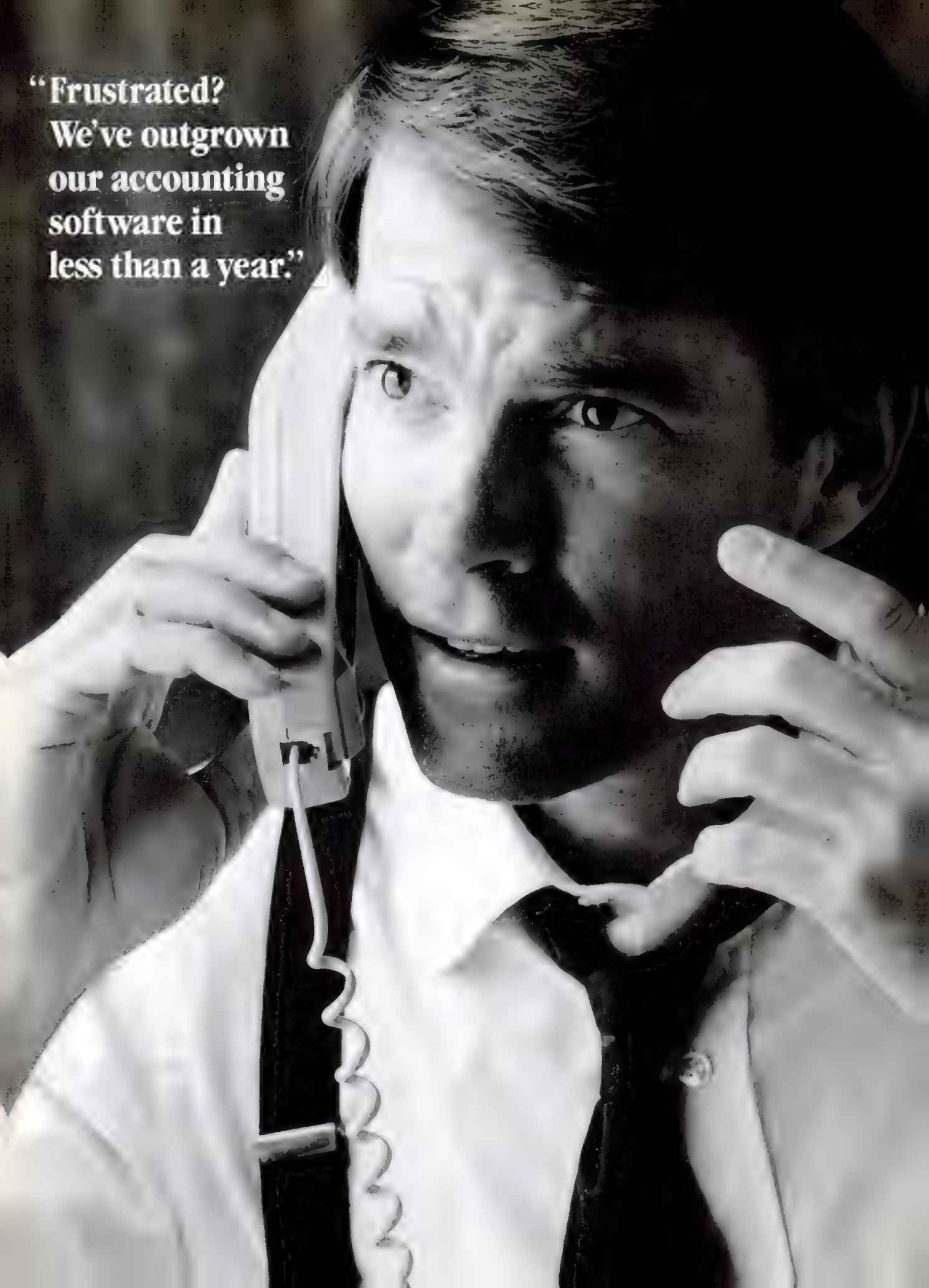
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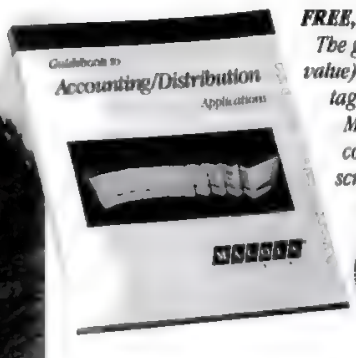

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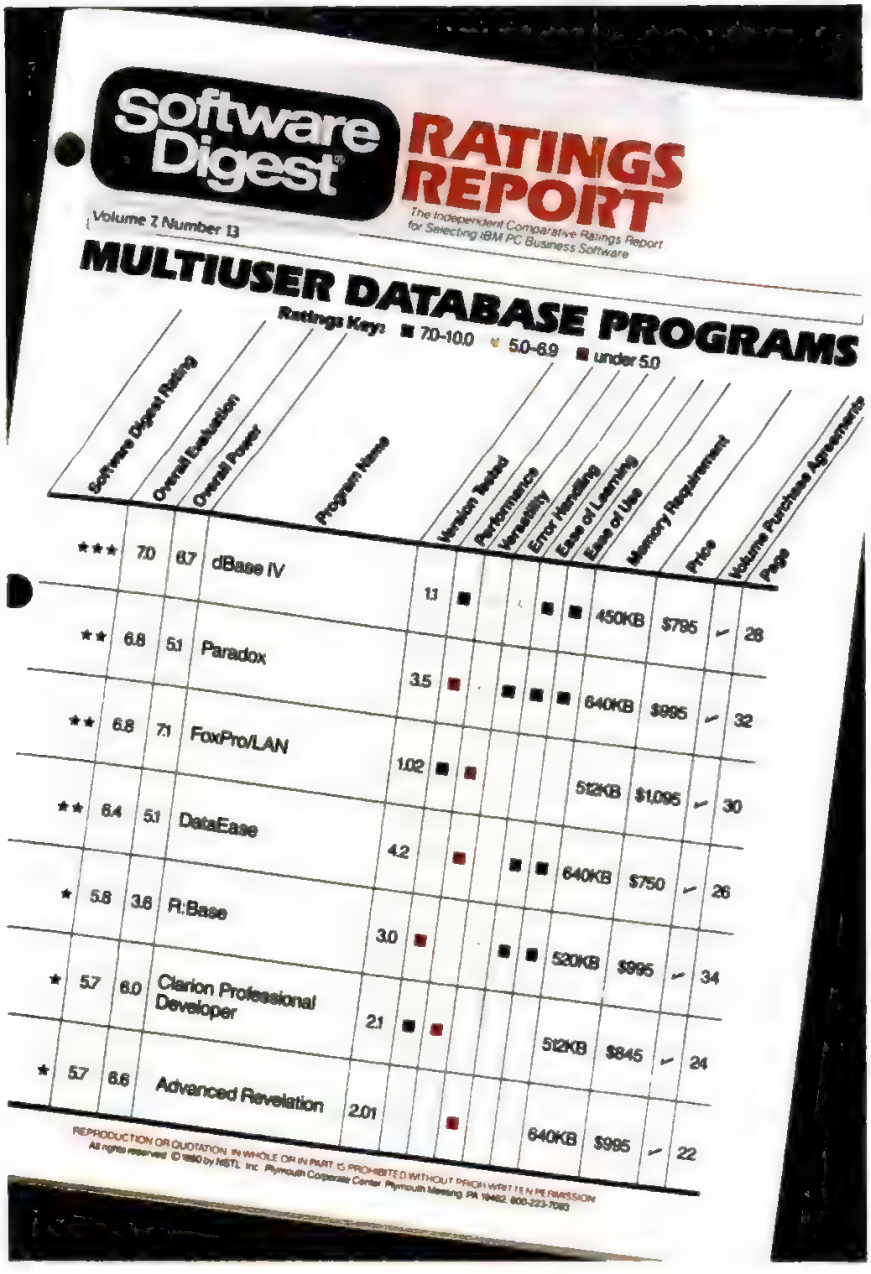

Software Digest RATINGS REPORT

The Independent Comparative Ratings Report for Selecting IBM PC Business Software

Volume 7 Number 13

MULTIUSER DATABASE PROGRAMS

Ratings Key: ■ 7.0-10.0 ■ 5.0-6.9 ■ under 5.0

Software Digest Rating	Overall Evaluation	Overall Power	Program Name	Version Tested	Performance	Versatility	Error Handling	Ease of Learning	Ease of Use	Memory Requirement	Price	Volume Purchase Agreements	Page
★★★	7.0	6.7	dBase IV	1.1	■			■	■	450KB	$795	✓	28
★★	6.8	5.1	Paradox	3.5	■		■	■	■	640KB	$995	✓	32
★★	6.8	7.1	FoxPro/LAN	1.02	■	■				512KB	$1,095	✓	30
★★	6.4	5.1	DataEase	4.2		■		■	■	640KB	$750	✓	26
★	5.8	3.6	R:Base	3.0	■			■	■	520KB	$995	✓	34
★	5.7	6.0	Clarion Professional Developer	2.1	■	■				512KB	$845	✓	24
★	5.7	6.6	Advanced Revelation	2.01			■			640KB	$995	✓	22

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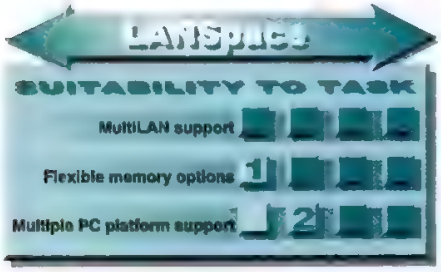
memory. After loading NET3/NET4 into extended memory, *LANSpace* informs you of the conventional memory you gained and checks the *LANSpace* version on the workstation against the version on the file server. If they're different, it updates the workstation's version to match.



Installation works easily because *LANSpace* installs itself into the SYS:LOGIN directory of the file server. You only need to copy the program LANSPACE.EXE to your PC's boot-up drive. Then, using an ASCII text editor (not supplied with the software, unlike *NetRoom*), you replace the NET3 or NET4 command in your AUTOEXEC.BAT file with LANSPACE.

LANSpace also lets you load or unload the NetBIOS emulator found in *NetWare*, using a program called Netload. You can do this without rebooting your PC. By keeping NetBIOS out of conventional memory, you can pick up almost 20K of RAM for your applications. *LANSpace* also supports PS/2 systems, Compaq 386 PCs, and virtual disk drive software operating under DOS 4.01.

PEACEFUL COEXISTENCE

LANSpace works with most of the popular memory managers like AST's *RAMpage*,

FACT FILE

LANSpace, Version 1.8
LANSystems Inc., 300 Park Ave. South, New York, NY 10010; (800) 458-LANS, (212) 995-7779.
List Price: $495 per file server.
Requires: 256K RAM, 64K extended memory, Novell's *NetWare*, Version 2.1 or later, DOS 3.0 or later.
In Short: *LANSpace* moves the *NetWare* shell into 64K of extended memory, while taking less conventional memory than Novell's new shell for extended memory. A product for those frugal with conventional memory, it's especially useful to Novell users running the NetBIOS emulator. It does require registration within 30 days of installation.

CIRCLE 613 ON READER SERVICE CARD

LAN MEMORY MANAGEMENT SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	QEMM-386	AboveLAN	386MAX	NetRoom	LANSpace
List price	$99.95	$119.00	$130.00	$149.00	$495.00
Multiuser price	N/A	$495 (per file server)	$2,438 (25-user site license)	$249 (10-user version)	N/A
MEMORY AREA SUPPORT					
Supports high-DOS	■	■	■	■	⌟
Supports extended memory	■	■	■	■	■
Supports LIM 3.2 and 4.0	■	⌟	■	■	■
Supports EEMS	■	⌟	■	■	■
DRIVER AND SHELL MANAGEMENT					
Loads IPX files into:					
High-DOS	■	⌟	■	■	⌟
Expanded memory	⌟	⌟	⌟	■	⌟
Extended memory	⌟	⌟	⌟	■	⌟
Loads NET3/NET4 files into:					
High-DOS	■	⌟	■	■	⌟
Expanded memory	⌟	⌟	⌟	■	⌟
Extended memory	⌟	■	⌟	■	■
Swaps IPX and NET3/NET4 files in and out of high-DOS	⌟	⌟	⌟	■	⌟
NETWORK OPERATING SYSTEMS					
Supports Novell *NetWare* ELS/SFT/386	■	■	■	■	■
Supports DOS-based LANs	■	⌟	■	■	⌟
Supports Banyan *VINES*	■	⌟	■	■	⌟
NONNETWORK PROGRAM MANAGEMENT					
Relocates non-LAN TSRs	■	■	■	■	⌟
Relocates device drivers	■	■	■	■	⌟
Relocates cache programs	■	■	■	■	⌟
COMPATIBILITY					
Runs on XT-class machines	⌟	⌟	⌟	■	⌟
Runs on AT-class machines	⌟	■	⌟	■	■
Runs on 386- and 486-based machines	■	■	■	■	■
CUSTOMER SUPPORT*					
Toll-free technical support	⌟	⌟	⌟	⌟	■
Extended service contracts available	■	■	⌟	■	⌟

—Editors' Choice ■—Yes ⌟—No
N/A—Not applicable: The product does not have this feature.
*All products provide a 90-day warranty.

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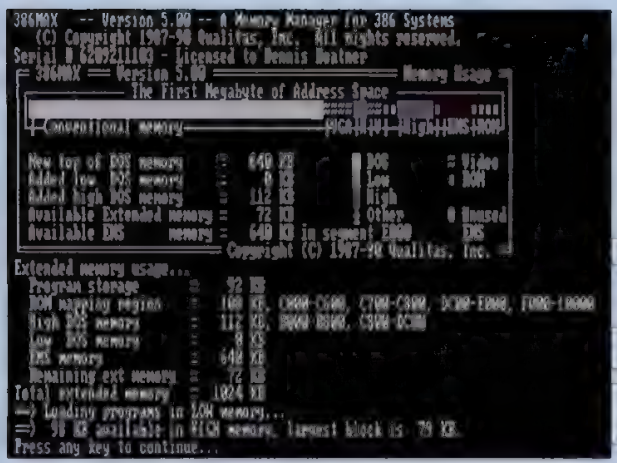
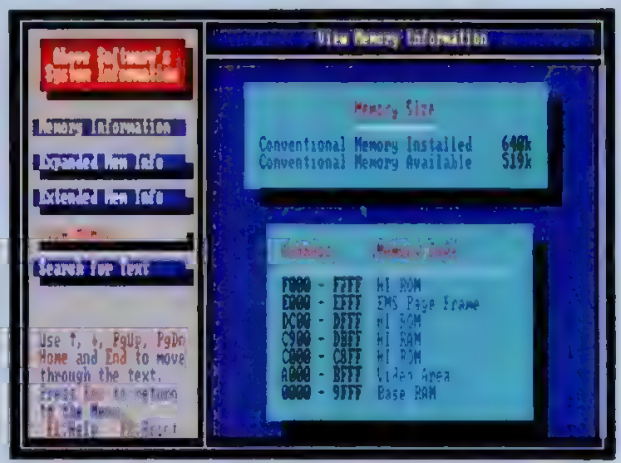
THE LOOK OF LAN MEMORY MANAGEMENT

Network administrators' jobs are tough enough; they don't need to be slowed down by inscrutable management software that hinders instead of helps them.

These LAN memory management software packages not only help you configure your workstation's memory, they also provide a real-time view of the memory areas inside your PC and the hexadecimal addresses where they begin and end. Some of the packages incorporate this mapping feature within the main program, while others include a separate utility to supply this perspective. LANSystems' *LANSpace* package is not shown here, since it does not present a visual interface.

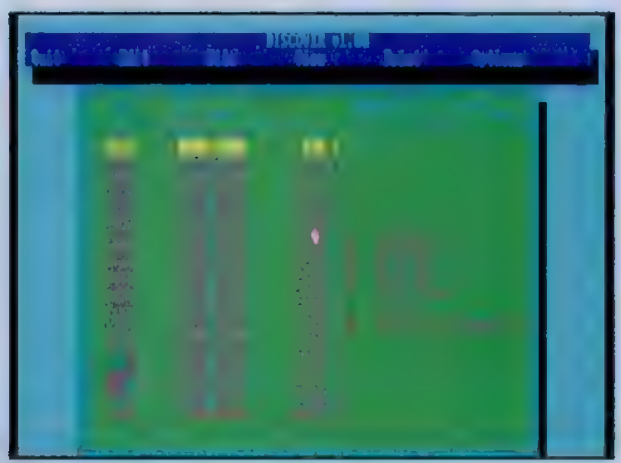


386MAX displays a map of conventional memory, VGA memory, high-DOS, ROM, and all available extended and expanded memory.



The *AboveLAN* system information screen displays the total conventional memory, available conventional memory, and all memory addresses, along with the type of memory found at each location.

The *Manifest* program packaged with *QEMM-386* shows various aspects of your PC's configuration. Displayed here is a visual presentation of expanded memory, including the mappable pages, page frame, and unmappable areas of memory.



NetRoom's Discover utility displays a memory map of your configuration, emphasizing the page frame area. It also permits editing of the AUTOEXEC.BAT and CONFIG.SYS files during installation.

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Products listed here in red are Microsoft Windows Applications.

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8367 ▣ATM & Plus Pack Bundle ..... 169.
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8000 ▣Persuasion 2.0 for Windows.... 399.

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7336 ▣Label Pro 1.0 for Dot Matrix ..... 49.

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7568 ▣FaceLift 1.0 for Windows 2.x/3.0 . 59.
8368 □FaceLift 1.0 & Microsoft Windows Productivity Pack 1.0 ..... 99.
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6245 ▣Pop Drop Plus 1.0..... 59.

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7357 □Turbo C++ 1.0 Professional .... 219.
7356 □Turbo Pascal Professional 2nd Ed. 179.
6242 ▣Quattro Pro 2.0 ..... 339.
1514 ▣Paradox 3.5..... 569.

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8114 ▣Backup 6.0 ..... 65.

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Concentric Data Systems ... NCP
6575 ▣R & R Relational Report Writer 3B 109.

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5506 □CorelDRAW! 2.0 ..... 389.

Custom Applications ... NCP
7474 □Freedom of Press 2.2..... 255.

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Franklin Software ... NCP
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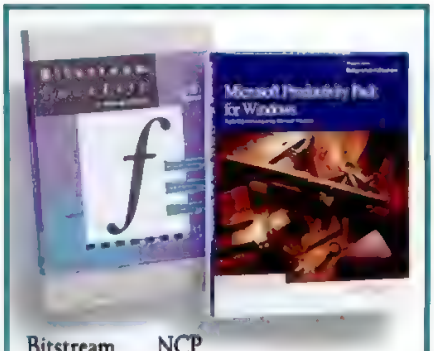
2856 ◙ Excel 2.1 . . . . . 329.
2853 ◙ C Compiler 6.0 . . . . . 339.
8137 ◙ Office for Windows. . . . . 659.



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6397 ▣ The Norton Backup 1.1 . . . . . 105.
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3425 □ Q&A 3.0 . . . . . 229.

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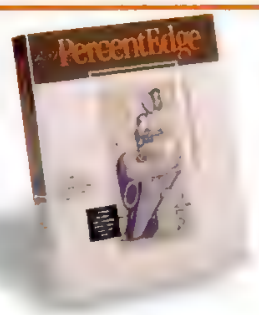

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3804 □ WordPerfect 5.1. . . . . 265.
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7061 BOCARAM/XT 0K *(0-2 Meg, LIM 4.0)* 99.
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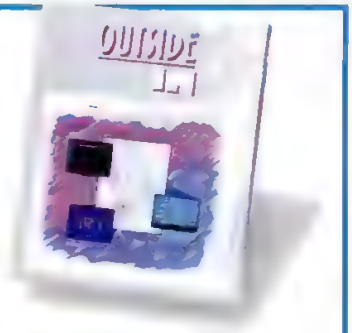

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7775 Equity LT-286e Laptop . . . . . 1995.
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2352 2400B Internal Modem 2 *(for PS/2)* 249.
5119 2400 Baud External Modem . . . . . 179.
6420 2400EX MNP Modem . . . . . 229.
7880 9600EX Modem . . . . . 549.
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5336 Above Board Plus 8 2 Meg . . . . . 599.
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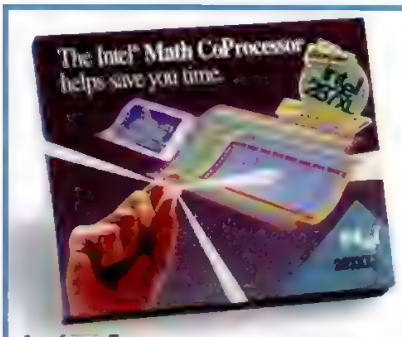
4670	1.44 Meg Drive for PC/XT *(3½")*	89.
4326	1.44 Meg Drive for AT	109.



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2792	3½" DS/DD 720k Diskettes *(Qty. 10)*	14.
2793	3½" DS/HD 1.44Mb Diskettes *(Qty. 10)*	27.

Sony ... lifetime

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3292	5¼" DS/HD 1.2Mb Disks *(Qty. 10)*	19.
3297	3½" DS/DD 720k Diskettes *(Qty. 10)*	13.
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Intel's *AboveBoard*, Microsoft's EMM.SYS, Quarterdeck's *QEMM-386*, and Qualitas's *386MAX*. The program doesn't move other non-LAN TSRs, cache programs, or memory managers around—it only works with NET3/NET4 and NetBIOS files. *LANSpace* stays compatible by not attempting to interfere with the operation of other memory managers. If any errors occur during usage of other memory management programs, a message appears in code and English to let you know exactly what went wrong. (Since the package has no real interface, no screen display is included with this evaluation.)

Those of you who don't like copy protection will have mixed feelings about *LANSpace*. LANSystems doesn't hinder your ability to use the software on every networked PC, but you do need to register your copy within 30 days of the installation date. LANSystems requires a key number in order for the product to work as a functioning application after that time period.

LANSystems warrants its product against any defects in the floppy disks for an unlimited period. It also provides unlimited toll-free technical support from 9 A.M. to 7 P.M. EST. *LANSpace* frees up 35K of conventional memory, and if you're using its Netload program on NetBIOS, it doesn't require that you reboot your workstation to regain conventional memory. The product provides significant benefits to Novell users running the NetBIOS emulator program.

NetRoom

by Frank J. Derfler, Jr., and R. Dennis Boatner

NetRoom, Version 1.0, from Helix Software works like a top-drawer program sold at a bargain-basement price. It provides unique memory management features and superb utilities that put it ahead of its competitors. Helix offers several different pricing schemes, including a four-user version for $149 and a 100-user version for $595.

NetRoom duplicates many features found in Helix's standalone product *HeadRoom*. In *NetRoom*, however, Helix places the emphasis on moving the LAN-related files IPX and NET3/NET4 into high-DOS. While the program includes excellent utilities for using the memory in high-DOS, its unique value comes from its ability to move network drivers into expanded or extended memory.

NetRoom contains a program called RAMMAN.EXE to convert extended memory to expanded memory. Other programs in *NetRoom* work in tandem with RAMMAN to relocate applications, drivers, and data files from conventional into higher areas of memory. You can load RAMMAN from the AUTOEXEC.BAT or CONFIG.SYS file. RAMMAN functions as both the XMS and LIM EMS 4.0 driver in *NetRoom*. *NetRoom* supports all standard PC chip sets, ranging from 8086 to i486-based platforms and extended and expanded memory (LIM 3.2 or 4.0 compliant).

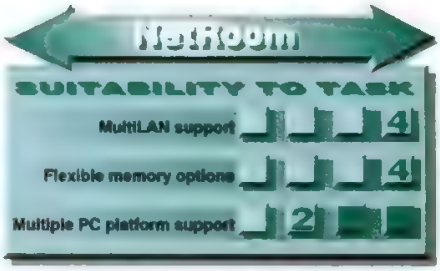
NetRoom looks for unused memory in the PC and tries to allocate it for network driver use. The program employs three different memory techniques to help you gain conventional RAM for application programs. First, you can load data into high-DOS, as space allows. Second, you can load files, including IPX and NET3/NET4, into LIM EMS 4.0 expanded memory. Finally, you can load those same programs and files into extended memory.

NetRoom uses a unique swapping feature to access data and programs in extended or expanded memory.

SWAPPING FILES INTO MEMORY

NetRoom uses a unique swapping feature to access data and programs in extended or expanded memory. Depending on your PC's configuration, Helix's program takes over expanded or extended memory and uses it to swap relatively large programs from conventional memory. Under *NetWare*, this feature gives you 500K or more of usable conventional RAM. You can also use this feature to load mouse drivers and other interface drivers into areas outside of conventional memory.

NetRoom gave excellent results in our quest to save RAM for DOS applications. Even in a complex computer configuration with a SCSI hard disk controller and VGA, *NetRoom* loaded IPX and NET3 into high-DOS and saved 48.9K in conventional memory. We must report, however, that the program worked this magic by moving the page frame to a location normally reserved for the ROM BIOS, but is unused in this particular PC. This solution won't work in every PC.



When we loaded those same two network program elements into expanded memory instead of high-DOS, we saved 41.2K of conventional RAM. Loading into HMA saved 32.2K of memory for DOS applications. The residual programs *NetRoom* leaves in conventional memory are responsible for the differences in the amount of memory saved. We didn't see much degradation in network throughput with IPX and NET3 in high-DOS or HMA, but throughput dropped about 20 percent when we loaded them into expanded memory.

During operation, *NetRoom* monitors the LAN and applications environment

FACT FILE
EDITOR'S CHOICE

NetRoom, Version 1.10
Helix Software Inc.,
83-65 Daniels St.,
Bnarwood, NY 11435;
(800) 451-0551, (718) 262-8787.
List Price: Four users, $149; ten users, $249; file server license (for up to 100 users), $595.
Requires: 64K extended memory (or some expanded memory conforming to LIM EMS 3.2 or 4.0 specifications), Novell's *NetWare* (or any DOS-based LAN operating system).
In Short: *NetRoom* uses an unusual swapping feature to solve even the toughest memory management problems, although the swapping may slow down I/O operations. Nevertheless, the program's ease of installation, bundled diagnostic program *Discover*, and low price make *NetRoom* a cost effective way to free up your conventional memory.

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and swaps the programs and data in and out of expanded or extended memory. It does this automatically and transparently without your intervention, while keeping the network connections flowing continuously.

NetRoom's selection of quick-start programs for Novell users makes installation simple, and the package uses very descriptive error messages to illustrate problems clearly.

This technique has two drawbacks. First, it takes some time to swap the data in and out, which can slow down all I/O operations. Second, memory swapping is not compatible with all multitasking operating environments.

You can also create additional extended memory of up to 64K RAM using the XMS driver for the HMA included with the software. If you need more high-DOS memory between 640K RAM and 1MB for TSR programs, device drivers, or the IPX and NET3/NET4 LAN modules, then you can even use the EMS page frame inside the high-DOS area. This permits you to access from 32K to 128K of additional memory, based on your PC's configuration. Your machine must support LIM EMS 4.0 to use this feature.

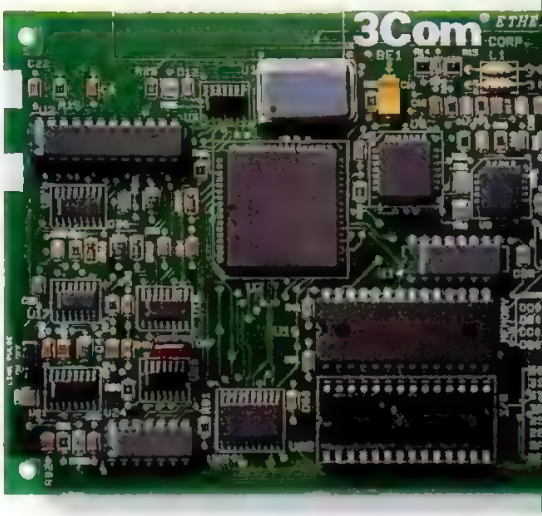
DIAGNOSTICS AT INSTALLATION

NetRoom's selection of quick-start programs for Novell users makes installation simple. *NetRoom* uses very descriptive error messages to illustrate problems clearly during operation. Helix's documentation gives good explanations about all types of memory found in your PC, yet it doesn't cover every eventuality under various memory configurations, so the company runs an excellent technical-support program to compensate. When you run into a problem, the technical support staff can ask you to fax them reports printed from *NetRoom*'s utility programs to aid in the diagnosis.

NetRoom's documentation doesn't cover every eventuality, so the company runs an excellent technical support program to compensate.

NetRoom includes a special utility

Oh, what a twis



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called Discover that performs much of this diagnosis. Only Quarterdeck's *Manifest* is similar in its menu-driven interface and memory-mapping capabilities. Discover displays the type and amount of additional RAM that your PC has or can use. The program also tells you which device driver you need to add to the CONFIG.SYS file to create a particular configuration. Discover's built-in editor makes this part of the installation easier by letting you modify the CONFIG.SYS file from inside the program.

If you need to load an executable program at boot-up, Discover also lets you modify the AUTOEXEC.BAT. The most flexible of all the packages we reviewed, *NetRoom* provides all the device drivers Discover recommends.

NetRoom works with all versions of Novell's *NetWare*, IBM's *PC LAN*, Banyan's *VINES*, DCA's *10NET*, Artisoft's *LANtastic*, and other DOS-based LANs. Helix warrants its product for 90 days and provides unlimited technical support at a toll number from 9 A.M. to 5 P.M. EST.

NetRoom supplies an excellent set of solutions for solving the RAM crisis on your LAN. Its Discover program adds extra value with the ability to diagnose your system and assist you in editing your AUTOEXEC.BAT and CONFIG.SYS files. Even PCs with tightly jammed high-DOS areas can benefit from the memory-swapping capabilities of *NetRoom*.

QEMM-386

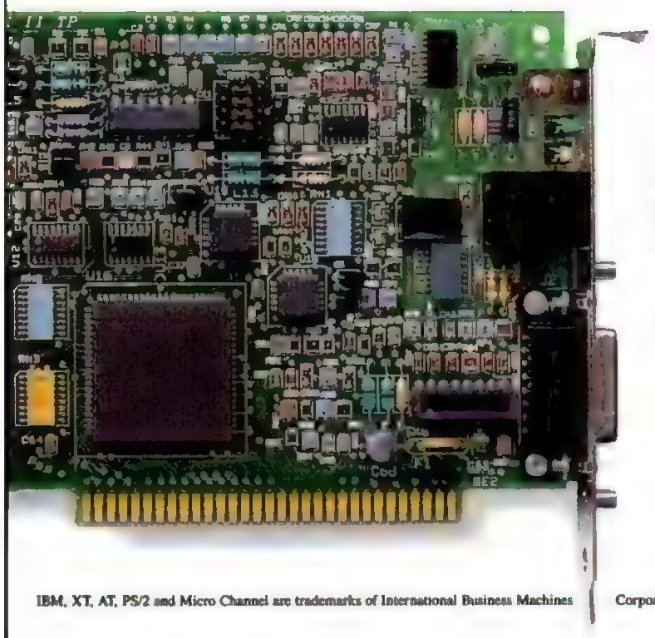
by R. Dennis Boatner

Quarterdeck's latest release of *QEMM-386*, Version 5.11, gives 386 users more flexibility, especially in working with *Microsoft Windows* 3.0 programs under *DESQview*. They can place numerous conventional memory-based programs, TSRs, network redirectors, and network drivers into their high-DOS memory area. But once these files move into this area, *QEMM* takes a rigid approach and doesn't allow any of the other programs to access that region simultaneously. Nevertheless, the program's cost-to-features ratio is good. This version of *QEMM*, Version 5.11, is bundled with *Manifest*, a memory analysis and reporting tool, and together it sells for $99.95. Quarterdeck does not offer network pricing.

The *QEMM* version reviewed here works only on 386-based machines. However, *QRAM*, a memory manager also made by Quarterdeck, supports PCs in the

Quarterdeck's latest release of *QEMM-386*, Version 5.11, gives 386 users more flexibility, especially in working with *Microsoft Windows* 3.0 under *DESQview*.

ted life it leads.



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XT and 286 class. *QRAM* sells for $79.95 and results in approximately the same overall RAM savings as its big brother *QEMM-386*.

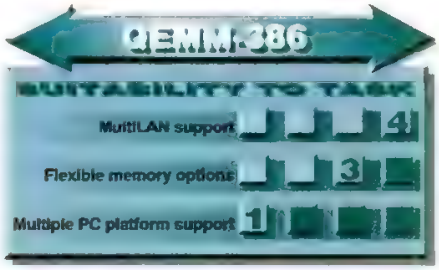
OPTIMIZING MEMORY

QEMM's menu-driven installation is generally easy to do, except in complex configurations. The complete and easy-to-understand documentation for *QEMM-386* and *Manifest* gives you numerous options to set up special programs, such as *Windows* 3.0 or *WordPerfect*, based on your system's current memory setup. It also offers explanations of the location of different types of memory and how you can best use them to fit your needs.

By using the *QEMM-386* LoadHi program, we were able to load IPX and NET3 into high-DOS memory. But to free up the maximum amount of conventional memory in your workstation, you must use a program called Optimize. Optimize reads your AUTOEXEC.BAT and CONFIG.SYS files and transparently places your TSRs and device drivers into the high-DOS area. The program then displays how it temporarily reworked these files in the high-DOS area and the approximate amount of conventional RAM you might pick up.

Optimize did not work automatically on a relatively complex computer with a SCSI hard disk adapter and VGA video adapter. Instead of opening space in conventional memory, *QEMM* actually moved the page frame from high-DOS into conventional memory, placing it at memory location 9000–9FFF. We also needed to specify a buffer for the SCSI adapter that took another 2K of conventional memory. Overall, due to the expansion of buffers and the conventional memory used by *QEMM-386*, we only gained 20.8K of RAM from conventional memory.

We didn't like the fact that *QEMM-386*



simply allowed the computer to freeze when we tried one suggested option of loading the *NetWare* programs into high-DOS memory. Under the same circumstances *386MAX* anticipated the problem and provided us with a warning message in English.

DESQVIEW AND WINDOWS TOGETHER

Since *QEMM* was one of the first memory management programs and remains one of the most popular, many users are already familiar with it. Version 5.11 of *QEMM* now provides memory compatibility between *DESQview 386* (also made by Quarterdeck) and programs designed to run under *Windows* 3.0 in either real or standard mode. In conjunction with this version of *QEMM*, *DESQview* can run *Windows* applications. They use the real and standard modes of *Windows* 3.0 most often, since the enhanced mode of operation requires a minimum 4MB of memory.

This version of *QEMM-386* also supplies both XMS and EMS 4.0 support in a single driver. In fact, Quarterdeck's product adheres to all industry standards of LIM EMS 3.2 and 4.0 and EEMS for hardware and software. *QEMM-386* also works with all versions of Novell's *NetWare*, IBM's *PC LAN*, Banyan's *VINES*, DCA's *10NET*, Artisoft's *LANtastic*, and all other DOS-based LANs.

Quarterdeck warrants its product for 90 days against defects in the floppy disks. It also provides unlimited technical support during the first 90 days. You can call the technical support staff at Quarterdeck's toll number from 9 A.M. to 5 P.M. PST. The support staff offers a service called Q-FAX that allows registered and nonregistered customers to have direct access to the company's technical notes and product updates.

QEMM-386 furnishes a useful platform to manage and access additional memory, but it adopts a rigid approach since it doesn't permit the user to swap the network files if an application needs that space. Nevertheless, *QEMM*'s only real shortcoming is its lack of pricing for a LAN package.

386MAX

by Frank J. Derfler, Jr., and R. Dennis Boatner

Qualitas markets three memory management products. Each one works in different types of PCs to make as much high-DOS memory available as possible. Despite this wealth of alternatives and the high-technical quality of the products for 386-based PCs, its best-known program, the $130 *386MAX*, didn't help us conserve conventional memory in our complex configuration without first soliciting some special consultation and taking some drastic steps.

QEMM-386 furnishes a useful platform to manage and access memory, but it adopts a rigid approach since it doesn't permit the user to swap the network files if an application needs that space.

386MAX is aimed at all i386- and i486-based PCs. *BlueMAX*, priced at $155, is nearly identical to *386MAX*, but it includes special capabilities to increase the free high-DOS in True Blue IBM PS/2 i386 computers.

Move'em is the $89 Qualitas product

FACT FILE

QEMM-386, Version 5.11 Quarterdeck Office Systems, 150 Pico Blvd., Santa Monica, CA 90405; (213) 392-9701.
List Price: *QEMM-386*, $99.95 per user; *QRAM*, $79.95 per user (both products include *Manifest*).
Requires: 256K extended memory or Chips and Technologies shadow RAM (LIM EMS 4.0 hardware for *QRAM*), DOS 2.0 or later.
In Short: *QEMM-386* provides 386 users with the alternative of loading network drivers into high-DOS, but it takes a rigid approach after swapping network drivers into that area and won't always trap errors. Despite its lack of multiuser pricing, it is a good value.

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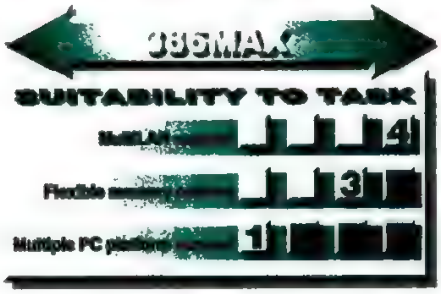
targeted at PCs equipped with the i286 processor. *Move'em* can work in all hardware conforming to the LIM EMS 4.0 standard and in computers using the Chips and Technologies NEAT or LEAP chip set. This means that it can even work with an XT-class computer equipped with the necessary hardware. If you want to determine if your hardware is compatible, use your



modem to dial the Qualitas electronic bulletin board at (301) 907-8030 and download a program called CHIPSET.COM. *Move'em* doesn't move files into expanded memory; it simply uses the relocation capabilities of the LIM EMS 4.0 specification to move them out of the way into high-DOS.

Qualitas also sells a 25-user site license for $2,438. This package lets you mix all the different Qualitas programs so you have the flexibility of using the right version of software for each of the PCs on your network.

MAXIMIZING MEMORY

The installation guides for *386MAX* and *BlueMAX* include a set of quick-start cards on the inside cover to help speed up the installation process. Both include an analysis and configuration program called Maximize that's similar to *QEMM-386*'s Optimize. Working through a menu-driven interface, it loads as many files as possible into high-DOS memory, slightly more automatically than Optimize loads them.

Maximize also rearranges pockets of memory in high-DOS to make them contiguous and therefore more useful to applications normally residing in conventional memory. Qualitas takes a forceful approach to reconfiguring your PC's memory. It moves all memory-resident programs and drivers from conventional memory and places them into space it manages to recover in the high-DOS memory area. Then, during the initialization phase, the programs and drivers load in the most memory efficient sequence.

On the negative side, the structure of

> *386MAX*'s Maximize utility rearranges pockets of memory in high-DOS to make them more useful to applications normally in conventional memory.

Maximize makes it difficult to change utilities or drivers in your PC without rerunning *386MAX*. Maximize knows the order of the drivers and other programs going

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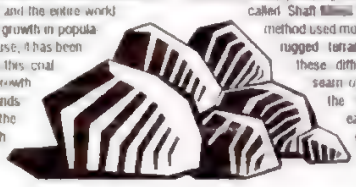

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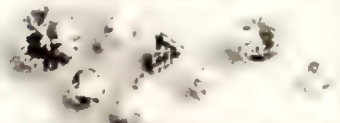

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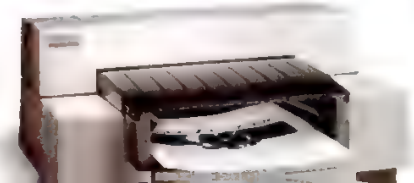
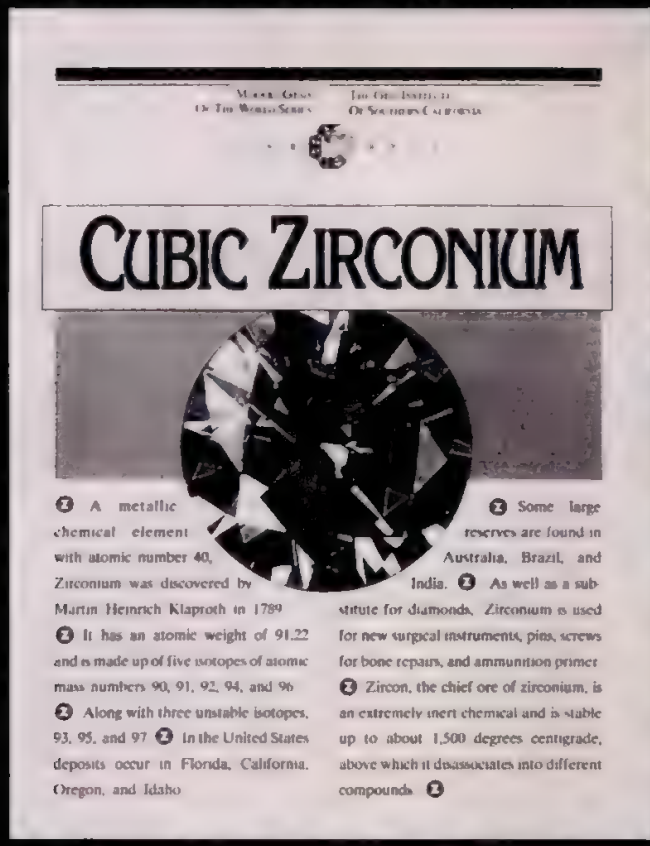


Enter the new, improved HP DeskJet 500 printer. At just $729, it's a gem. The 300 dpi inkjet technology makes your output look beautiful. Sharp and compelling. And our new water-resistant ink makes sure it stays beautiful.

As you'd expect, the [illegible]

Great looking price.

New HP DeskJet 500 printer $729.*



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HEWLETT PACKARD

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into memory and if you change anything you must rerun the program. Certainly it's good advice to rerun any of these memory assessment programs after you make a significant change, but Maximize forces you to do it!

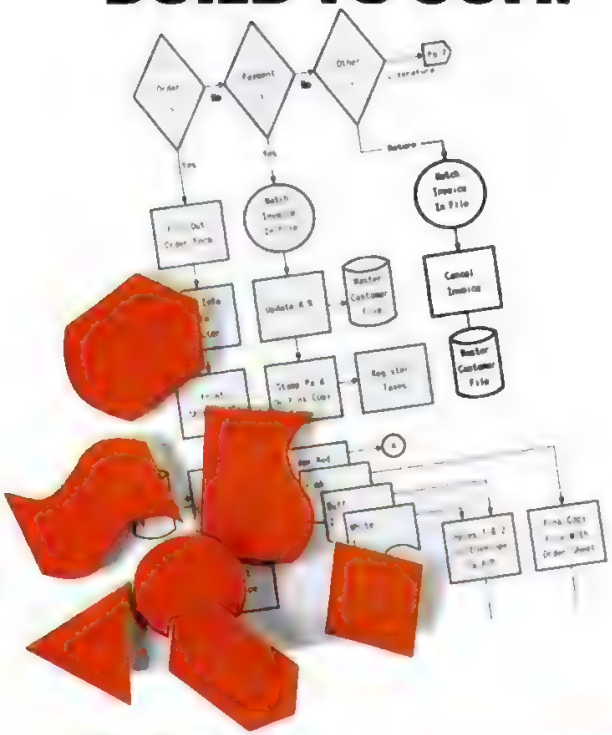
386MAX and *BlueMAX* also contain a feature called FlexFrame. The operation of FlexFrame is based on the fact that many programs, including Novell's IPX, use extra memory while they initialize. After the initialization step, they release the extra memory they don't need to run. It isn't unusual for these kinds of programs to load into high-DOS, but then fail to run when they hit a memory boundary. To avoid this, the two MAX programs move the page frame out of high-DOS long enough for the program to initialize and then restore the page frame when the program releases the memory space. Thus, with FlexFrame, Qualitas loads certain programs next to the page frame so they expand into the contiguous space.

In addition, both *386MAX* and *BlueMAX* can enhance your memory speed by converting read-only memory (ROM) into faster random-access memory (RAM) and moving the RAM found on most accelerator cards into the first 640K of conventional memory. The programs provide a set of diagnostic tools, including memory maps and a utility to determine RAM access time.

Both *386MAX* and *BlueMAX* can enhance your memory speed by converting ROM into faster RAM.

BlueMAX is uniquely configured to free up high-DOS in IBM PS/2 computers equipped with 80386 processors. Because IBM still puts data such as cassette BASIC in its ROM set, people using a PS/2 have significantly less high-DOS available than

BUILD TO SUIT.



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FACT FILE

386MAX, Version 5.0
Qualitas Inc., 7101 Wisconsin Ave., #1386, Bethesda, MD 20814; (800) 733-1377, (301) 907-6700.
List Price: *386MAX*, $130; *BlueMAX*, $155; *Move'em*, $89; 25-user site license for all programs, $2,438.
Requires: 256K extended memory, DOS 3.0 or later; *BlueMAX*: 386-based IBM PS/2; *Move'em*: Chips and Technologies NEAT or LEAP chip set, LIM EMS 4.0 compatible hardware.
In Short: The memory management products from Qualitas specialize in making high-DOS memory available, but they can be hard to configure on complex systems. *BlueMAX* is particularly valuable to anyone using a real IBM PS/2 computer with an 80386 processor.

CIRCLE 616 ON READER SERVICE CARD

they would with a similar non-IBM computer. *BlueMAX* overwrites the cassette BASIC, the power-on self-test that isn't needed during operation, and filler spaces to make slightly more than 80K of additional high-DOS memory available to the user.

MEMORY TRADEOFFS

Remember our caveat that PCs differ greatly in what memory managers can accomplish, but in the same complex machine where *QEMM-386* recovered 20.8K and *NetRoom* performed a feat of legerdemain by finding 48.9K, Maximize couldn't find enough contiguous memory to load IPX or NET3. The program didn't know how to handle the 3Com network adapter or the Attachmate 3270 adapter. Using a manual approach we managed to load IPX.COM into high-DOS, but the expanded environment space and Maximize program elements left in conventional memory resulted in a net loss, not gain, of 3.6K.

In the same complex machine where *QEMM-386* recovered 20.8K and *NetRoom* performed a feat of legerdemain by finding 48.9K, Maximize couldn't find enough contiguous memory to load IPX or NET3.

After consulting with Qualitas's technical support people, we moved the page frame completely out of high-DOS, thereby eliminating the use of LIM EMS memory, and loaded both IPX.COM and NET3.COM into high-DOS. The overall saving was 34.8K. Frankly, we'd have been better off using Novell's shell programs for extended or expanded memory.

Qualitas warrants its product for 90 days and provides unlimited technical support at a toll number from 10 A.M. to 5 P.M. EST. *BlueMAX* is a valuable program for anyone using a real IBM 386-based PS/2, and *386MAX* works well on most ISA bus computers. The FlexFrame feature is a real plus in both programs and it will certainly help solve some memory problems that no other memory management programs can touch. However, if you go too far astray of configurations and expansion products the Maximize program knows about, you might find yourself in for long talks with the friendly folks who manage the Qualitas technical support shop. ■

R. Dennis Boatner *is a computer consultant working in Florida.* **Frank J. Derfler, Jr.,** *is workgroup systems editor of* PC Magazine. **M. Keith Thompson,** *inventor of the AT TurboSwitch, is a frequent contributor to* PC Magazine.

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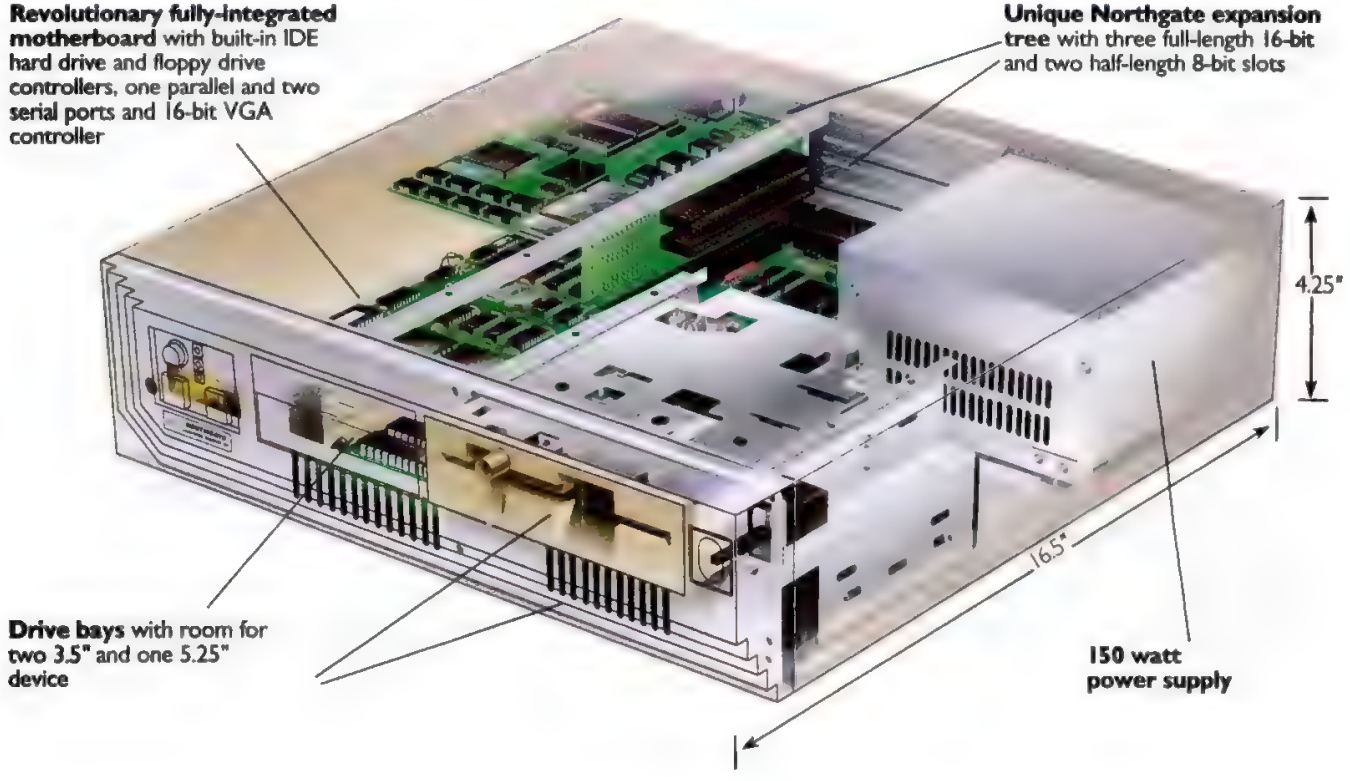

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INFO WORLD 1989 TOP 100

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- 16-bit VGA video adapter
- Eight expansion card slots
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100Mb IDE	$300.00	$600.00	$ 700.00	$ 950.00
200Mb IDE	$600.00	$900.00	$1000.00	$1250.00

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A married person may apply for individual credit. I am applying for (check one box, please):
- ☐ JOINT CREDIT with another person. Complete entire application.
- ☐ INDIVIDUAL CREDIT complete only individual section.
- ☐ INDIVIDUAL CREDIT but rely on income of another. Complete entire application.

*If you are a married Wisconsin applicant, you must provide your spouse's information as indicated, even though your spouse may not be signing the contract.

NOTICE TO WISCONSIN APPLICANTS
You must disclose your marital status:
- ☐ married
- ☐ unmarried
- ☐ legally separated

a. Personal Information

NAME _____ HOME PHONE (____) _____
SOCIAL SECURITY NUMBER _____ DATE OF BIRTH ____/____/____
PRESENT ADDRESS _____ CITY _____ ST _____ ZIP _____
DATE OF RESIDENCE MO. _____ YR. _____ BUY ☐ RENT ☐ OTHER ☐ _____
PREVIOUS ADDRESS _____
EMPLOYER _____ DATE OF EMPLOYMENT MO. _____ YR. _____
MONTHLY GROSS SALARY $ _____ BUSINESS PHONE (____) _____
PREVIOUS EMPLOYER _____ DATES OF EMPLOYMENT _____ TO _____

Income from alimony, child support or separate maintenance payments need not be disclosed if you do not wish to have it considered as basis for repaying the obligation.

ADDITIONAL MONTHLY INCOME $ _____ SOURCE _____

b. Credit Information

PLEASE TELL US IF YOU HAVE: CHECKING ACCOUNT (Y/N) _____ SAVINGS ACCOUNT (Y/N) _____
BANK LOAN (Y/N) _____ HOW MANY? _____ VISA (Y/N) _____ HOW MANY? _____
MASTERCARD (Y/N) _____ HOW MANY? _____ FINANCE COMPANY LOAN (Y/N) _____ HOW MANY? _____
DEPT. STORE CHARGE CARD (Y/N) _____ HOW MANY? _____ CREDIT UNION ACCOUNT (Y/N) _____ HOW MANY? _____
OTHER MAJOR CHARGE CARDS (Y/N) _____ HOW MANY? _____

c. Joint Applicant's Personal Information

JOINT APPLICANT'S NAME _____ HOME PHONE (____) _____
SOCIAL SECURITY NUMBER _____ DATE OF BIRTH ____/____/____
ADDRESS _____ CITY _____ ST _____ ZIP _____
DATE OF RESIDENCE MO. _____ YR. _____
JOINT APPLICANT'S EMPLOYER _____ DATE OF EMPLOYMENT MO. _____ YR. _____
MONTHLY GROSS SALARY $ _____ BUSINESS PHONE (____) _____
NAME AND ADDRESS OF NEAREST RELATIVE NOT LIVING WITH YOU _____
_____ RELATIONSHIP _____

d. Self-Employment Information

BUSINESS NAME _____ BUSINESS PHONE (____) _____
TYPE OF BUSINESS ☐ Proprietorship ☐ Partnership ☐ Corporation IN BUSINESS SINCE _____
YOUR ANNUAL INCOME FROM BUSINESS Gross $ _____ Net $ _____
PERSONAL BANKER'S NAME _____ BANKER'S PHONE (____) _____

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Talk To GoldStar.

Object to Object:

Vector File-Conversion Utilities

by Luisa Simone

Vector images are the current darling of PC-based graphics, and for good reason. Unlike bitmapped files, which print at exactly the resolution they were created no matter what the output device, vector files are device-independent descriptions of graphic shapes. Your output always takes advantage of the capabilities of your output device, whether it's the 2,450-dot-per-inch typesetter, a 4,000-line film recorder, or a 300-dpi laser printer.

Unfortunately, compatibility in the vector world is a moving target. New vector file formats emerge all the time as software designers dream up new capabilities for them to serve. And even the so-called standard formats are constantly revised—either officially, or unofficially through "tweaks" that software designers make to improve functionality or performance. What might be called cultural differences also come into play. Publishing applications tend to use the EPS format, which is based on the PostScript page description language and highly suitable for complex line art and shaded images. But presentation graphics programs like *Harvard Graphics* and *Freelance Plus* support CGM instead.

Vector graphics are a superior way of representing graphics for many purposes, but the world of vector file standards is a wild and woolly one. *HiJaak, Import, Import for Windows,* and *XPort* can help you cope with its variations.

PHOTOGRAPH: MARK DAVID COHEN

Though many graphics applications (notably drawing programs like *Micrografx Designer* and *Arts & Letters Graphics Editor*) have vector conversions built in, you may find that the flexibility and quality of the translations aren't always up to your needs. If so, check out the four programs reviewed here. *HiJaak* from Inset Systems is a DOS program that handles a wide variety of bitmapped as well as vector formats, while Micrografx's *XPort* is a *Windows* program that deals only with vector formats. The pair from Zenographics, *Import for Windows* and *Import*, differ in the conversions they can do as well as in their operating environments. But all of these packages import and export CGM files, and all import (some also export) other industry-standard formats such as .DXF, HPGL, Lotus .PIC, EPS and *Windows* Metafile (.WMF).

MORE THAN MEETS THE EYE

Given that vector files can be so easily scaled for printing on different output devices, you'd think that translating them into different file formats would be a piece of cake. All vector file formats should have the same general structure, beginning with a header (which contains such information as the color scheme used and the width and height of the image), followed by descriptions of the various types of objects that make up the image (points, lines, curves, polygons, and so on), and finished off by an end-of-file marker.

But in the real world, the various vector formats were designed for different primary functions and consequently describe images in fundamentally different ways. The CGM specification, for instance, originally created as a transport mechanism for moving graphics between incompatible programs, takes a lowest common denominator view, seeing images as collections of line segments, circles, and polygons. By contrast, the .DXF format was designed for CAD systems, to allow the recreation of accurate and editable architectural or mechanical drawings. It supports such complex information as associative dimensioning and three-dimensional objects, as well as CAD fundamentals like parabolas.

These variations make the process of massaging graphics data from one format into another fraught with technical difficulties. Take, for instance, the problem of translating an HPGL file to the CGM format. Originally designed as a plotter language, HPGL assumes that colored lines are drawn by using a number of pens with different-hued inks. Consequently, HPGL files don't actually contain any color information, just references to pen position. It may sound like a Zen koan, but how do you translate information that doesn't exist?

On the other hand, the source file may contain information that the target file just doesn't understand. A .GEM file, for example, can contain Bezier curves—a way of defining curves by control points and tangent lines—but most other standard vector formats, notably CGM, don't speak "Bezier." Similarly, though most vector formats support named text consisting of editable ASCII characters with type style, point size, and color attribute information attached, fonts tend to be designated by different names in different formats (see the table "Vector File Formats: Table of Elements").

CLEVER SOLUTIONS

One way to get around differences between formats is to use a mapping scheme that can take the form of an internal table within a conversion program or an interactive process controlled by the user. To replace the missing color information in an HPGL file, for example, *Import for Windows* presents you with a dialog box that allows you to assign a color to each numbered pen. For named text blocks, *XPort* uses an internal map to replace the font name in the source file with its equivalent in the target file, while *Import*, *Import for Windows*, and *HiJaak* let you mix and match source and target typestyles.

Where mapping fails, simulation steps in to reconstruct source file objects for which there is no direct equivalent in the target file. The most common simulation problem involves formats such as CGM that don't support sophisticated graphics shapes like Bezier curves or true circles. In this case, the conversion software must simulate them using a series of curve or line segments. Gradient fills cause similar hiccups. When you're converting an image with gradient fills into a format that doesn't support them, the translator simu-

EDITORS' CHOICE

• HiJaak

None of these programs is a completely satisfactory solution to your vector file-conversion problems. *HiJaak* from Inset Systems is strong in the conversion department but suffers from an awkward (though much improved) user interface and a distressing number of bugs. *Import for Windows*, from Zenographics, has a clean design and excellent viewing and printing facilities, but it's downright skimpy in its choice of output formats and lacks such useful options as the ability to translate between CGM flavors. And while Micrografx's *XPort* offers some useful .DXF options and is the only program that even attempts to convert the vector information in the Macintosh Pict format, the quality of its conversions can leave much to be desired.

That said, however, we can recommend *HiJaak* as the best of an imperfect lot. Though it has more than a few problems, these seem to be confined to its user interface layer; the conversions themselves are rock-solid and are intelligent enough to compensate for most pitfalls you'll encounter. It supports by far the greatest number of vector file formats (including EPS and .WMF, though not Macintosh Pict), and it handles ten different flavors of CGM with no user intervention. Best of all, you get a wide variety of raster conversions and screen-capture capabilities in the bargain, all for just $199.

Though *HiJaak* is the best overall choice, *Windows* users should take a good look at *Import for Windows*. Unlike *HiJaak*, it delivers a stable and well-designed user environment enriched with excellent viewing and printing functions. Its primary flaw is one of design; since it supports only two rather unsophisticated export formats (CGM and *Windows* Metafile) it fails to serve the more exacting needs of publishing users. But if your needs don't go beyond its capabilities, you may prefer it.

CGM: THE NONSTANDARD STANDARD

by Paul Murphy

If there is a vector file standard for illustration and presentation graphics uses, it is the Computer Graphics Metafile (CGM) format. Unlike other PC file standards such as .PCX or .WK1, which were originally proprietary formats that became accepted through wide use, CGM was an intentional act. Developed by the American National Standards Institute (ANSI), it was conceived from the beginning as a common, public format for interchanging graphics files.

Though the details of the various proprietary vector formats can differ widely, the ANSI team was able to rely on the fact that all vector-based graphics images are made up of sets of common elements (or primitives). The CGM standard supports several major types of primitives: lines (which may include polylines or arcs), fill areas (which include both circles and ellipses as well as polygons and rectangles), and text.

Each of these, in turn, are assigned attributes, such as line color and style, fill style or hatch pattern, and character size, type, and orientation. As a true metafile format, a CGM file can even incorporate bitmapped images along with vector objects, though few software packages actually support these so-called "cell arrays." By codifying the rules that govern how the primitives are placed into the file and proposing standard schemes for encoding the file itself, the ANSI standard makes it possible to use vector images in any program with a CGM interpreter.

THEORY AND PRACTICE

So much for the theory. The facts of the case, however, are quite otherwise. Though you should be able to bring a chart created in CGM format by *Lotus 1-2-3* into *Micrografx Designer* for dressing up, then place it into *Harvard Graphics* for slide creation, in practice the CGM formats supported by these products are incompatible with each other. Similarly, a CGM file created by Computer Support Corp.'s *Arts & Letters* is totally unreadable by the CGM interpreter in Lotus's *Freelance Plus*.

Since CGM is a true standard with a published specification, how do these variations arise? In the first instance, though the construction of the files is indeed closely defined in the ANSI specification, there are no minimum standards for the number of CGM features that must be supported in order for it to be fully compatible, so programs may support different subsets of features. Furthermore, the standard supports some variations. For instance, though CGM files are most commonly encoded using the binary method, plain text encoding is permissible.

Many software developers, impatient with the limitations of the published standard, have added proprietary fills and markers and other objects, and these deviations cannot be recognized by the CGM interpreters of other packages unless they are specially written to support them. *Harvard Graphics*, for instance, includes polka-dot and dithered fills in its CGM file format that are not supported in the ANSI standard.

A common oversight leads to problems in image sizing. In a CGM file, the basic properties of each primitive (including the coordinates that locate it within the image as a whole) are stored in the Picture Description section in the file header. A Virtual Device Coordinate (VDC), in turn, tells the receiving interpreter the size of the entire picture. Yet some software developers have disregarded the importance of reporting the VDC accurately, causing images to be too small or too large when imported.

A COMPLEX REALITY

As a result of these complexities, many developers have balked at the daunting task of writing CGM generators that implement the full specification in all its details, and handle all its informal variations. Though many graphics programs claim to import and export CGM files, in fact most of them support only a subset of the specification, and some can either import CGM files or export them, but not both. *Arts & Letters*, for instance, exports CGM files in three different commonly supported subsets.

All is not totally bleak, however. As software developers have become aware of the variations, they have developed smart file import/export filters to support all of them without the user having to specify which flavor is being converted. And another light of sorts can be discerned in the GSS*CGM Interpreter drivers offered by Graphic Software Systems (GSS) of Beaverton, Oregon. These are program routines that software developers can incorporate into their applications to allow them to produce files in a standard subset of CGM. In theory, any package that incorporates GSS drivers can read files created by other packages that use them, and hundreds of programs (including *Lotus 1-2-3*, Release 3.1) do so.

Even as it finally becomes a usable standard, the march of technology is leaving CGM behind. The current specification, last updated in 1986, does not support such important primitives as Bezier curves, and conversions from more full-featured proprietary formats inevitably leave much to be desired. With the increasing popularity of *Windows* 3.0, CGM's place as a vector standard is being challenged by the Windows Metafile (.WMF) format that is supported by all *Windows* applications.

Extensions of CGM have been proposed that would add more-sophisticated primitives, support vector clipping, and allow the inclusion of 3-D images in multiple views. But how long they will take to arrive, and whether they will be sufficient when they do is an open question. In any case, it is to be hoped that a new specification would make some attempt to standardize existing CGM implementations and prevent new variations. Only by this means can a semblance of unity be brought to this useful, but muddled graphics format. ■

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Toshiba T3100SX	2nd	2nd	1st	2nd	2nd	2nd	3rd	2nd	2nd	2nd	2nd	2nd	2nd
Zenith SupersPort SX Model 40	3rd	3rd	3rd	3rd	3rd	3rd	2nd	3rd	3rd	3rd	3rd	3rd	3rd

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CIRCLE 472 ON READER SERVICE CARD

lates the gradient by means of many thin bands of slightly varying shades. Simulation requires real sophistication on the part of the utility and can sometimes have undesirable results. But often it's the only way to bridge the gap between formats.

LIVING WITH IMPERFECTION

Given this situation, some imperfections are a fact of life. For one thing, the file size of a vector image is in direct proportion to the number of objects it contains. Think about how much data it takes to describe a circle as a series of lines rather than as a single graphics primitive with a center point and a radius, and you'll readily see that the file size will grow enormously. Not surprisingly, the programs in this roundup allow you to lower the quality of simulated curves in order to produce a smaller file.

Text conversion can involve similar difficulties. If the target format doesn't support named text, all of these programs will convert the text into a picture, simulating the letters in graphics outline form. But once this is done, it will no longer be possible to edit the text. Even though the two images look identical, they don't work the same way. And the file size increases dramatically, since coded text takes up a lot less space than the complex outlines needed to draw letterforms.

Keeping the file size down can be important not just to conserve disk space, but also to ensure that your graphics program can successfully import the image. Huge files with many objects are awkward to work with and use up memory quickly. If you've worked with *Windows* 2.*x* products, for example, you probably know that trying to load a *Windows* Metafile requiring more than 64K of RAM results in an out-of-memory message. Though *Windows* 3.0 has eliminated the underlying need for this restriction, the internal image buffers of many applications haven't been expanded yet, so it always pays to be careful.

Finally, as if broad issues of compatibility weren't enough, subtle problems also arise even within files of the same type. In particular, CGM has been bedeviled by a multitude of different flavors. Though it's one of the few file formats that actually has a published standard, this standard is loose enough, and vendors have generated enough extensions to it, that what constitutes an acceptable CGM file to one application may be completely unreadable to another (see the sidebar "CGM: The Nonstandard Standard").

Though all of these programs do vector file conversion, they differ in the number of file formats they address and in the number of conversion options they support, as well as in the quality of the conversions. Fortunately, neither file size nor conversion speed are issues that you have to worry about much; all of the programs performed comparably in our tests of these measures. Don't underestimate the importance of user interface. Though these are fairly simple programs, easily understood menus and logically designed batch modes can make a big difference in repetitive operations.

Examine the options, and choose the utility that supports the formats and features needed in your applications. With the right one, you'll never again have to see that oh-so-frustrating error message "unrecognized file format" again—well, almost never.

HiJaak

All reviews by Luisa Simone

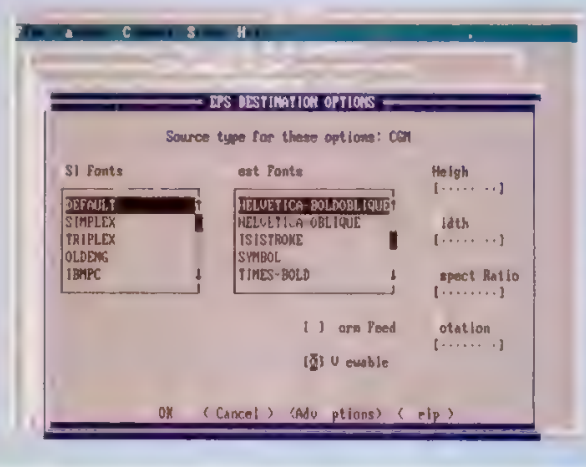
If the name weren't already taken, I'd suggest that Inset Systems change the name of its file-conversion utility from *HiJaak* to *Paradox*. The latest version of *HiJaak* ($199), which handles a number of vector file formats as well as an encyclopedic list of bitmapped formats, is something of a contradiction. Though its full-featured and accurate conversion routines are models of solid code, the product as a whole is marred by bugs and improperly implemented features.

When we last reviewed it (see "Solving your Image Problems: Three Conversion Utilities for Graphics Files," *PC Magazine*, August 1990), *HiJaak*'s archaic interface was a real detraction. The current version (2.0) has a new, completely redesigned interface that is SAA-compliant and has dialog boxes that make this character-based program usable with a mouse as well as with a keyboard. But though you enter information about the source files, input processing options, advanced input options, the destination file, output processing options, and advanced output options in a series of dialog boxes, you must enter the facts in exactly this order; you can't change any previous option except by escaping back through the sequence. This makes the program feel inflexible.

HiJaak does have fairly strong batch-mode processing. You can process a number of different source files in assorted file formats from several different subdirectories, though you must convert all of them to the same target format. Unfortunately, the configuration options are available only for the first source file type listed in the processing box; all the others are dependent upon settings made previously. *HiJaak* does get points for accepting—and remembering—file-extension aliases: Once *HiJaak* is aware of an alternate acceptable file extension, it will recognize .PCC as .PCX, .PLT as HPGL, and .LBM as .IFF without further prompting.

A SMORGASBORD OF FORMATS

Though its interface is not what you'd call perfect, *HiJaak* generously compensates with a very robust set of file conversions. The list of supported file formats alone is



The stacked windows in this *HiJaak* screen show the order in which you must enter the information into the program. The last options box lets you selectively map the fonts in the source CGM file to PostScript typefaces in the target EPS file. You can also set sizing and rotation options here.

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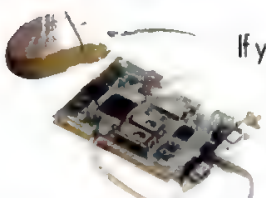

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FACT FILE
EDITORS' CHOICE

***HiJaak*,**
Version 2.0
Inset Systems, 71 Commerce Dr., Brookfield, CT 06804; (203) 740-2400.
List Price: $199.
Requires: 512K RAM, hard disk, DOS 3.1 or later. Mouse recommended
In Short: Despite a still-awkward user interface and far too many bugs, *Hijaak*'s broad range of high-quality conversions makes it the best choice for most users, and future versions should be more stable.

CIRCLE 608 ON READER SERVICE CARD

impressive: In addition to the standard CGM, .DXF and HPGL formats, it handles EPS, .GEM, Lotus .PIC, .WMF, Hewlett-Packard .PCL, and even *WordPerfect* Graphics (.WPG) and Presentation Manager Metafile formats. And that's only on the vector side; *HiJaak* also supports the bitmapped formats TIFF, .PCX, .GIF, *Halo* .CUT, Targa .TGA, *GEM* .IMG, *MacPaint* .MAC, and 19 different fax formats.

Among the programs reviewed here, only *HiJaak* can convert vector formats to bitmapped formats as well as to other vector formats—a real convenience if you need to import an image into a program that accepts only bitmapped images. *HiJaak* is also notable for its flexible handling of the most problematic file specifications; it's smart enough to distinguish between ten brand-name versions of CGM and 35 variations of TIFF. The only chink in its armor comes with Macintosh Pict conversions; though this is a metafile format that contains both vector and raster information, the version of *HiJaak* we evaluated recognized only bitmapped data in Pict files.

HiJaak is rich in processing options for both vector and bitmapped images. When converting between vector formats, for example, users not only can preserve named text, but can choose which typefaces *HiJaak* will use in the process. If *HiJaak* doesn't already know about the typefaces in a particular file format, you can scan the file for additional font names, then use these names in conversion. *HiJaak* lets you assign a specific line weight and color to the pen numbers in an HPGL or Lotus .PIC file. And you can simulate Bezier curves with either medium, fine, or ultrafine curve segments. You can rotate vector images in one-degree increments, and I particularly liked *HiJaak*'s ability to convert color vector images to monochrome or gray scales during format conversion. *HiJaak* even lets you save text screens as vector files, which means that you can resize them without any loss of quality.

For bitmapped images, *HiJaak* supports color reduction, a range of dither or halftoning patterns, and a choice of monochrome or gray-scale output. You can resize converted bitmaps without fear because *HiJaak* includes a smoothing algorithm to reduce jaggies. For simple tonal corrections, *HiJaak*'s built-in brightness and contrast controls work well.

There are a few detractions. *HiJaak* cannot maintain image aspect ratios automatically during conversion. And it has no direct image viewing or printing functions (though you can get printouts of files by converting them to PostScript or Hewlett-Packard LaserJet (.PCL) format and then copying them to your printer). Fixes for these omissions would be desirable improvements.

QUALITY CONVERSIONS, BUT. . . .

HiJaak bests the competition in the quality of its conversions as well as in their number. It performed consistently well on all of our tests: It correctly interpreted the viewpoint of the 3-D objects in our .DXF file, it translated the Bezier curves in our .GEM test file with the chosen degree of smoothness, and it readily mapped fonts in a CGM source file to the user-defined fonts in a target EPS file. The only performance snag we found in its vector conversions came with a viewable TIFF header on an EPS file, which turned out to be invisible.

Though *HiJaak*'s conversions are top-drawer, bugs in other areas made our evaluation version far too crash-prone. Something as innocuous as an invalid path statement can knock you out to the DOS prompt, and running out of swap space on your hard disk causes the program to freeze. Conflicts between my Logitech mouse driver and the program's Resident Process Manager (RPM), which is supposed to act as a task switcher between *HiJaak* and other DOS applications (it also gives you screen-capture capabilities at the cost of only 5K of RAM), betrayed the potential of *HiJaak*'s new mouseable interface. The utility to capture *Windows* screens was similarly buggy: It kept giving internal errors when translating screen grabs from *HiJaak*'s proprietary .IGF format to standard .PCX form. Finally, though some features such as clipping and color remapping for the screen-capture program are documented in the manual, they didn't make it into our evaluation version. Inset Systems says a soon-to-be-released revision will fix most bugs and will include the promised features; the company will ship the update to all registered users for free.

When you consider the basic purpose of a conversion program, *HiJaak* looks like a good investment: For just $199, you get a groaning smorgasbord of high-quality vector and raster conversions and just about all the processing options you'll ever need. Though its still-awkward interface could stand improvement, and it has too many bugs for unqualified kudos, it's the best choice for most uses.

Import

Once you've seen *Import for Windows*, working with its DOS counterpart, *Import*, feels a lot like turning back the clock. Its anachronistic interface relies almost completely on the function keys. You can't move through subdirectories to search for files; you can't specify a new filename for the converted image; and you can't write a file to any location except the current directory. Error trapping is nonexistent; the program, for example, blithely lets you overwrite a target file without warning you first. And to preserve the current settings, you must consciously save them in an initialization file, then remember to specify this filename on the command line when you next start the program.

Fortunately, all of *Import*'s functions can be accessed directly from the DOS prompt, either by using command line parameters (-l, for instance, causes the program to save error messages in a log file) or by giving the names of batch routines that you set up within the program. *Import*'s batch routines are restricted to a single conversion operation—one source file type, one destination file type, and one set of conversion parameters—but you can paste together multistep conversions using DOS batch files. Unfortunately, you can process only 36 images in a single

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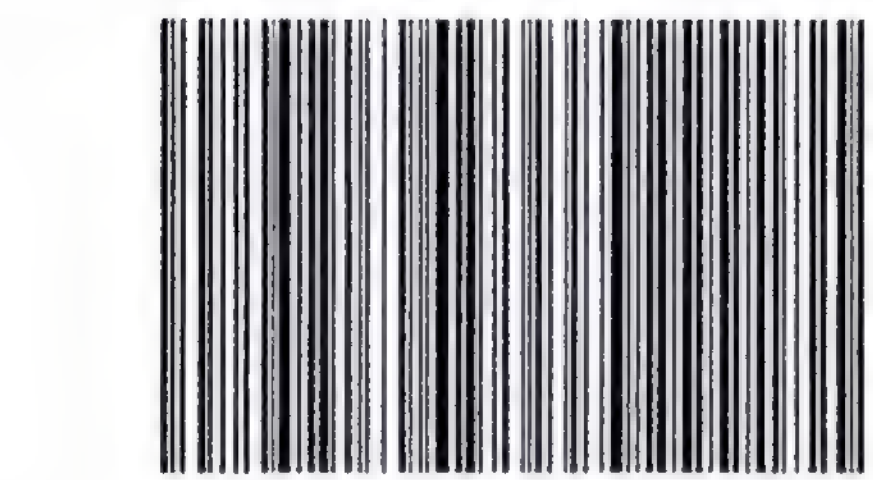

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Foldout slip-sheet

1. Open the foldout page
2. Insert this sheet with
    1. Front side touching the free page
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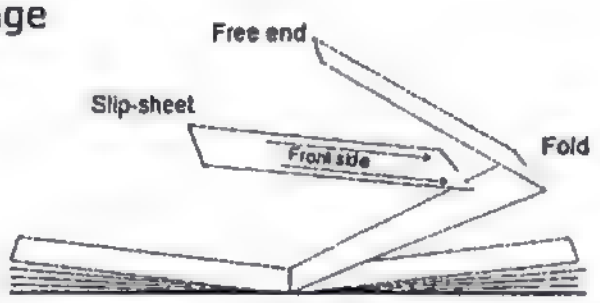

Inverted Foldout slip-sheet

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2. Insert this sheet with
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Back

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10 Good Reasons To Buy From ZEOS®

Reason #1

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batch (the number of frames in a roll of slide recorder film)—a severe limitation.

FEW FORMATS

Import is also rather weak in its file handling. It imports a fairly wide variety of formats, including three flavors of CGM, HPGL, and Lotus .PIC. It handles *AutoCAD*'s .ADI and .SLD formats and *AutoShade*'s .RND format, as well as its own more common .DXF interchange format, and you can determine the minimum line thickness for .DXF files, choose to omit hatch patterns, preserve PLINEs, use 16- or 256-color palettes, or swap foreground and background pens. The program even supports the .PIC format used by General Parametric's *VideoShow* presentation system and the SCODL format used by Matrix and some other slide recorders. But with all these imports, it exports files to only two formats—the proprietary .IMA format used by *Mirage*, Zenographics' high-end presentation package, and an ANSI CGM format.

Indeed, Zenographics seems to have had *Mirage* users in mind when it designed *Import*'s sometimes quirky feature set. For example, the program has what looks like a conversion routine to bring raster TIFF and Targa files into the *Mirage* .IMA format. Though the program lets you save these files with a CGM extension, don't be fooled: The "conversion" is really only a pointer system, and the information in the resulting file will be understood only by *Mirage*.

The program is also lacking in its implementation of controls over CGM file options. The separate input screens for *Freelance* and *Harvard Graphics* CGM files merely allow you to toggle through the various configuration maps that *Import* will use to analyze the file. Thus, if you want to change the parameters used to interpret these images, you must exit from the program and edit the ASCII map files with a text editor. Since you can't convert a CGM file of one flavor to a CGM file of another, the only way you can use these images is to convert them to *Mirage*'s .IMA format.

A final word of warning: The maps shipped with our review copy of *Import* weren't compatible with *Harvard Graphics* 2.3, though that product had been on the market for some time before we tested. As a result, landscape-oriented images were positioned incorrectly in the bounding box—in effect clipping off part of the picture. We were, however, able to download an updated map from the Zenographics bulletin board that fixed the problem.

PRINT AND PROOF

The plain-vanilla version of *Import* does not let you print images directly. But an additional $100 will buy you Zenographic's SoftRIP technology for the HP PaintJet (a Tektronics 4693 DX version costs $200), which lets you do this, with options such as landscape or portrait orientation; fine, medium, or coarse print quality; and single or multiple copies.

Import's single most useful output option is the ability to print a converted image to the screen, which makes it easy to examine different translation settings. But because screen output is considered a final destination, getting the final, translated file requires you to go back to the output menu; choose the output file type, CGM file, or printer; reconfigure the output options, then retranslate the file—an awkward and unnecessary step.

Mirage users who must translate a variety of images into that program's proprietary format will probably be willing to overlook *Import*'s many faults. But most users should opt for Zenographics's *Windows*-based product, or one of its competitors.

FACT FILE

***Import*, Version 4.0**
Zenographics Inc., 4 Executive Circle, #200, Irvine, CA 92715; (714) 851-2266
List Price: *Import*, $295; SoftRIP driver for Hewlett-Packard PaintJet, $100; SoftRIP driver for Tektronix 4693DX, $200.
Requires: 640K RAM, hard disk, DOS 3.1 or later.
In Short: Unless you are a Zenographics *Mirage* user, *Import Plus* should be a low priority on your shopping list. A few nice functions aren't nearly enough compensation for an antiquated user interface and severely limited export options.

CIRCLE 609 ON READER SERVICE CARD

Import for Windows

Import for Windows is the only *Windows* program in this review. A *Windows* 3.0–specific program, this $295 utility makes good use of *Windows* 3.0's memory and disk spooling functions. Also, you can send translated files directly to the currently installed *Windows* printer, be it black-and-white dot matrix, color ink jet, or a PostScript laser printer. And because *Import* converts files to *Windows*' native .WMF format, it can easily display images on the screen as well as produce files usable by just about any *Windows* application.

Import for Windows offers sophisticated previewing options. You can zoom in on a picture in one of four different magnification modes (2x, 4x, 8x, or 16x). Its on-screen previews are remarkably efficient; you know right away if a conversion isn't successful. Its AutoZoom Printer option, which creates a logical one-to-one relationship between screen pixels and printer dots, offers a truly accurate printed preview. If you are flummoxed by a CGM file that contains multiple images, you can use *Import for Windows*' unique View option to flip through

***Import* for the Hewlett-Packard PaintJet is operated almost exclusively using the function keys. If you want to see an on-screen preview of the translated image, you must press F3 to select the screen as the output device.**

VECTOR FILE CONVERSION SOFTWARE: SUMMARY OF FEATURES

All of these products convert to and from various different vector graphics file formats, including CGM, .DXF, EPS, HPGL, Lotus .PIC, and Windows Metafile (.WMF).

VECTOR FILE CONVERSIONS

CGM file conversions refers to the ability to convert the various flavors of CGM files, including those supported by *Harvard Graphics* and Lotus *Freelance Plus*. Options include the ability to detect the flavor of a CGM source file without user intervention and the ability to convert between one CGM flavor and another.

AutoCAD file conversions include the ability to convert files in the .DXF interchange format, as well as other formats supported by *AutoCAD*—slide (.SLD), plot (.ADI), and *AutoShade* surface (.RND) formats. .DXF options include the ability to pick up the last viewpoint of 3-D objects in .DXF files, the ability to incorporate symbols and other images from external shape libraries in the final target file, and the ability to render dimensioning information, invisible lines, and block attribute information from the original .DXF file. You can also reverse black-and-white objects for easier viewing.

PostScript file conversions include the ability to convert source files to two types of vector Encapsulated PostScript (EPS) files (monochrome only, and full-color or gray-scale formats), as well as the ability to attach a TIFF image of the file that can be viewed during placement in some desktop publishing programs.

Miscellaneous file conversions include the ability to convert to several other common formats, including the .GEM format used by Digital Research applications, the plotter-oriented file formats HPGL and Lotus .PIC, the Macintosh and *Windows* Metafile interchange formats (Pict and WMF), and the *WordPerfect* graphics format (.WPG). Support for conversion of bitmapped formats and for screen capture is also indicated where available.

CONVERSION OPTIONS

Color-to-black-and-white conversion indicates whether the product has an option to generate a black-and-white target image from a color or gray-scale image in the process of conversion. Similarly, **color-to-gray-scale conversion** indicates whether the product has an option to convert colors to gray scales.

Color simplification indicates whether the product can translate a source file with more colors than the target format can support by mapping to the closest colors in the target file.

Vector-to-raster conversion indicates whether the program can convert vector-format images to a bitmapped format such as .PCX or TIFF.

User can set curve quality indicates whether the program lets you determine how many polylines or line segments may be used to recreate a curve; this feature is used when you are converting from formats that support Bezier or other mathematical curve objects to formats (such as CGM) that do not. A finer setting uses more segments and produces a shape that more closely duplicates the original curve, but at the cost of making the target file bulkier.

Scale images and **rotate images** indicate whether the program gives you an option to change the size or orientation of the source images during conversion.

Font support for text indicates whether the program is able to use its own fonts to render text stored in a metafile format. **User can define font mapping** indicates whether the user can determine which fonts will be used in the target file.

OPERATIONAL FEATURES

Batch conversion is the ability to convert several files at once without user intervention after each one. An **error log** shows the error messages that may have been generated during conversion, letting you review the progress of a conversion after the fact. **Macros** let you automate a sequence of operations in the program.

View files indicates whether you can view the images in your source and/or target files from within the program. **Print files** indicates whether you can print out the images and, if so, which of several popular types of printers are supported.

MISCELLANEOUS FEATURES

If you're using *Windows*, you'll be interested in knowing whether your conversion utility is a **Windows 2.x** or **Windows 3.0 application.** (The latter indicates whether the product runs in *Windows* 3.0's protected modes and uses its memory management features.)

Memory support indicates whether the product supports expanded and extended memory specifications and whether it can overflow large jobs to disk. Better memory support makes it easier and faster to convert large images with many objects.

Technical documentation on formats indicates whether the product's documentation has a section that gives the technical details of how objects are converted between formats. This information can be very helpful in finding out how successful your conversion can be and where you're likely to have trouble.

all the pictures in the series. There is only one "windowing" function that I wish could be added to the program: the ability to keep multiple translations of a file on-screen simultaneously for comparison purposes.

By default, *Import for Windows* translates only one file at a time. But a special dialog box lets you collect various source files for batch processing (alas, only one target format is supported per batch). You can also print out multiple collated copies.

EXPORT RESTRICTIONS

The focus on the *Windows* environment has a downside. Though *Import for Windows* can interpret quite a wide range of formats, including CGM, HPGL, Lotus .PIC, *AutoCAD*'s interchange (.DXF), slide (.SLD), and plot (.ADI) formats, and even *AutoShade* shaded surfaces (.RND), it will only export files in three formats: two flavors of *Windows* Metafile (the vanilla metafiles supported by most *Windows* applications and the variation supported by Aldus programs), and the plainest of ANSI CGM files. You can't even translate between the three flavors of CGM that the program can read (*Harvard Graphics*, *Lotus Freelance*, and ANSI). And though *Import for Windows* knows how to print .WMF files to the screen, the printer, the clipboard, or to disk, it doesn't know how to translate them to other formats.

What it does, it does well, though. Logical and consistent conventions make *Import for Windows* easy to learn and use. Once you've successfully mapped fonts for CGM files, for example, you can map fonts for all file types. *Import for Windows* not only lets you replace the type style, but also such type attributes as weight and relative type size. And instead of carrying all this font information as overhead, *Import for Windows* reads the names of the fonts that are installed in your printer—another example of its close reliance on *Windows* facilities (in this case, the Control Panel).

Since interpretation takes place when you reach the file, conversion parameters apply only to source files. With HPGL and Lotus .PIC files, *Import for Windows* goes the competition one better by letting you choose the pen colors from point-and-shoot palettes (though you can't assign line widths). *Import for Windows* is notable for supporting *AutoCAD* plot and slide files and *AutoShade*-rendered sur-

VECTOR FILE CONVERSION SOFTWARE: SUMMARY OF FEATURES

Products listed in ascending price order

	HiJaak	XPort	Import	Import for Windows
	$199	$199	$295	$295
CGM FILE CONVERSIONS				
CGM flavors (converts from/to):				
Harvard Graphics	■/■	■/■	■/□	■/□
Lotus Freelance	■/■	■/■	■/□	■/□
CALS	■/■	■/■	□/□	□/□
PageMaker	■/■	■/■	□/□	□/□
ANSI	■/■	■/■	■/■	■/■
Autodetects CGM input flavors	■	□	□	□
Converts between CGM flavors	■	■	□	□
AUTOCAD FILE CONVERSIONS				
AutoCAD formats (converts from/to):				
.DXF	■/■	■/■	■/□	■/□
Other AutoCAD formats	□/□	□/□	■/□	■/□
.DXF conversion options:				
Translates 3-D views	■	□	□	□
Uses external shape libraries	□	■	□	□
Translates associative dimensioning	□	■	□	□
Suppresses invisible lines	■	□	■	■
Shows block attributes	■	■	□	□
Can reverse black and white	■	■	■	■
POSTSCRIPT FILE CONVERSIONS				
EPS file types (converts to):				
Monochrome	■	□	□	□
Gray scale or color	■	□	□	□
Can attach TIFF file for viewing	■	□	□	□
MISCELLANEOUS FILE CONVERSIONS				
File formats (converts from/to):				
.GEM (GEM)	■/■	■/■	□/□	□/□
HPGL	■/■	□/□	■/□	■/□
.PIC (Lotus)	■/■	□/□	■/□	■/□
Pict1 (Macintosh)	□/□	■/■	□/□	□/□
Pict2 (Macintosh)	□/□	■/■	□/□	□/□
.WMF (Windows Metafile)	■/■	□/□	□/□	■/■
.WPG (WordPerfect Graphics)	■/■	□/□	□/□	□/□
Supports bitmapped formats	■	□	□	□
Screen capture	■	□	□	□
CONVERSION OPTIONS				
Color-to-black-and-white conversion	■	□	□	□
Color-to-gray-scale conversion	■	□	□	■
Color simplification	■	■	■	■
Vector-to-raster conversion	■	□	□	□
User can set curve quality	■	■	□	□
Scale images	■	■	□	□
Rotate images	■	□	□	□
Font support for text	■	■	■	■
User can define font mapping	■	□	■	■
OPERATIONAL FEATURES				
Batch conversion	■	■	■	■
Error log	■	■	■	□
Macros	□	□	□	□
View files	□	□	■	■
Print files	□*	□	Optional	■
MISCELLANEOUS FEATURES				
Windows 2.x application	□	■	□	□
Windows 3.0 application	□	■	□	■
Memory support:				
Expanded	■	■	■	■
Extended	□	■	□	■
Overflow to disk	■	■	■	■
Technical documentation on formats	■	■	■	■
On-line help	■	■	■	■

—Editors' Choice ■—Yes □—No

*HiJaak generates PostScript or HP LaserJet files that can be copied to a printer.

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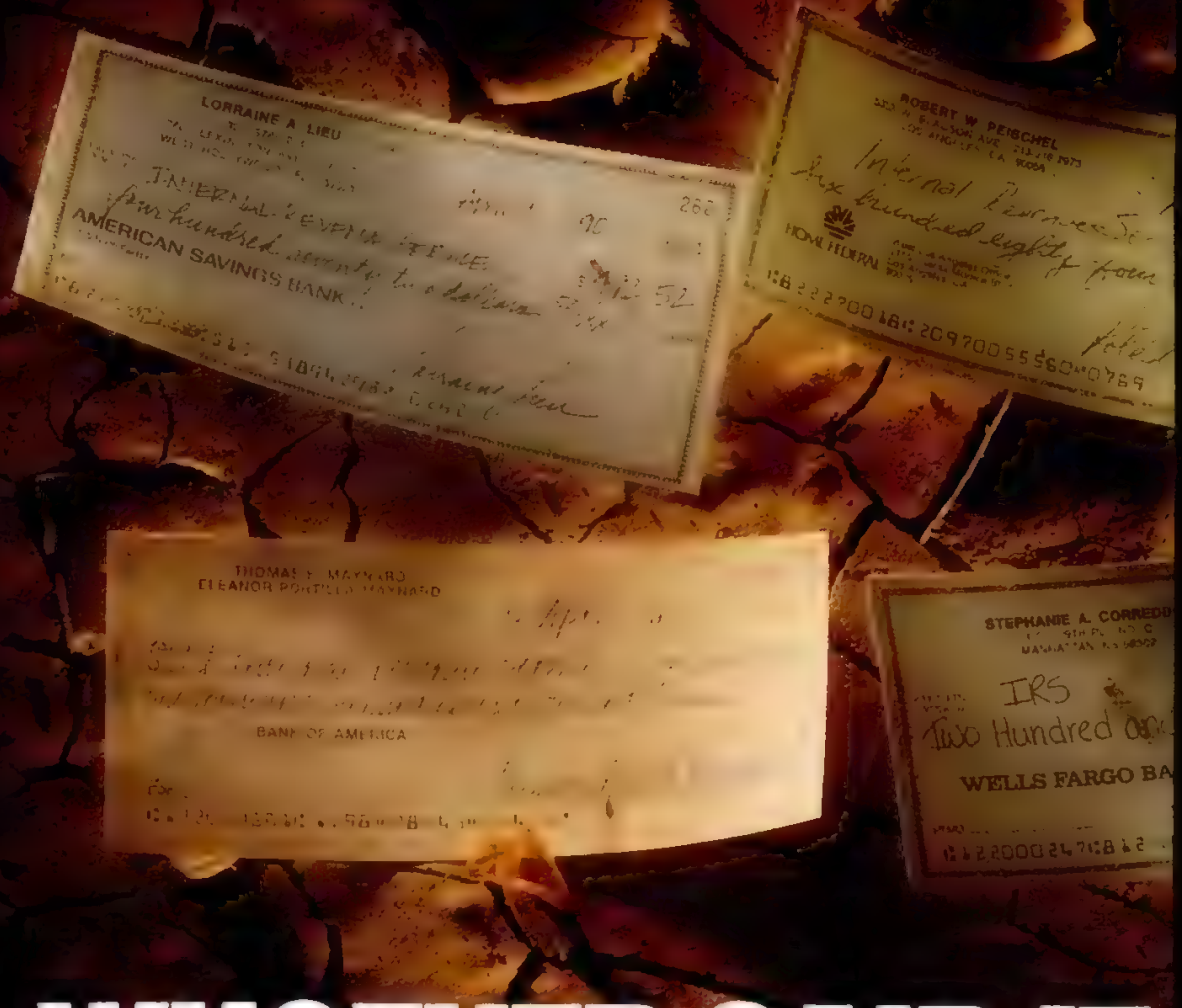

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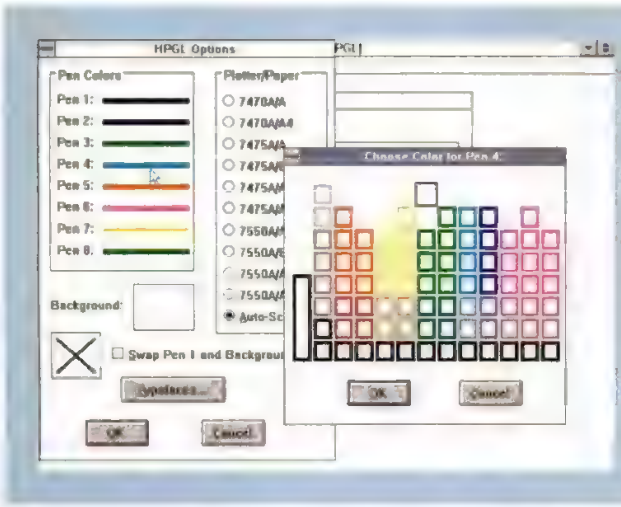

Import for Windows' **advantageous use of *Windows* dialog boxes makes it easy to remap pen positions in an HPGL source file simply by clicking on a pen number. You can select any color you want from the pop-up palette box.**

faces, as well as the more usual .DXF files, but it doesn't support shape libraries, nor does it let you see the saved view of three-dimensional objects (in our .DXF test file, *Import for Windows* rendered the 3-D objects from a default overhead viewpoint, which may or may not be useful).

When importing a CAD file, you can set a minimum line thickness, swap the background and foreground colors, and choose either a 16- or 256-color palette. The size of the target file can be controlled by omitting hatch lines from .DXF images (each of which counts as a separate object), maintaining PLINEs as polylines, and preserving coded text. There isn't much that you can do to reduce the size of translated .RND files. *AutoShade* defines each facet of an object as a separate polygon, and the resulting CGM file tends to be quite large.

FACT FILE

Import for Windows,
Version 4.0
Zenographics Inc., 4 Executive Circle, #200, Irvine, CA 92715; (714) 851-2266.
List Price: $295.
Requires: 1MB RAM, hard disk, DOS 3.1 or later, *Microsoft Windows* 3.0. EGA or VGA graphics adapter and mouse recommended.
In Short: *Import for Windows* is cleanly designed and offers excellent viewing and printing facilities, but it exports only to CGM or .WMF formats, which somewhat limits its utility.

CIRCLE 610 ON READER SERVICE CARD

SETTINGS

Unlike *HiJaak*, *Import for Windows* can't automatically detect the difference between *Harvard Graphics* and *Freelance* CGM files. It uses internal map files to substitute information for values that are known to be problematic, such as the orientation and bounding boxes of *Harvard Graphics* files or the color information of old *Freelance* files. Though less convenient than the automatic method, this mapping approach seems to work well: in fact, with the proper maps, *Import for Windows* was the only one of these conversion programs to correctly interpret the colors in a *Freelance* CGM file. Still, the information contained in these text-based substitution tables should be put where it belongs—into interactive dialog boxes along with the other CGM conversion options like minimum line thickness and font mapping.

Only two problems cropped up during testing. Our HPGL to CGM conversions were plagued by clipped images until I switched from an incorrect plotter/paper size setting to the handy autosizing function. And though *Import for Windows* does have options to force color images to gray scale and to maintain a picture's aspect ratio, neither of these settings had any effect on the test .WMF file. *Import for Windows* doesn't allow you to change the information in a *Windows* Metafile, period.

With its versatile on-screen views and sophisticated direct printing functions, *Import for Windows* is unrivaled in convenience and ease of use. But its deliberate restriction to the unsophisticated CGM and .WMF output formats, which cannot handle complex objects such as Bezier curves, is a major limitation, and it's not very strong on batch processing options, either. Though it's a useful tool for anyone bringing occasional files into the *Windows* environment, it falls short as a general-purpose solution.

XPort

Most *Windows* applications fill up the entire screen when you open them. This isn't true of Micrografx's *XPort*, which seems in many ways more like a large dialog box than a full-fledged program. At $199, *XPort* is small in both conception and performance.

With support limited to CGM, .DXF and .GEM (in additon to Micrografx's own proprietary .DRW format), *XPort* fails to convert two of the most important PC vector graphics standards: EPS and .WMF. The latter omission is especially mystifying because *XPort* runs under *Windows* and should support its native file format. It's the only one of these programs that attempts to tackle the vector information in Macintosh Pict files. But on-screen file viewing, direct printer output, and clipboard support are all absent.

Because Micrografx chose to remove many of the program's processing parameters from user control, *XPort* is also short on some important conversion options. Though it converts text in editable form from one format to another, the system by which it matches equivalent fonts is not user-definable. And *XPort* always gives you the highest number of colors from the source file that the destination file can support; you can't selectively convert a color image to gray scale or black and white.

SIMPLICITY

The options that *XPort* does offer are easy to use, though, thanks to the simplicity of *XPort*'s interface. And its batch processing mode is exceptionally flexible. A list box contains all of the files you have chosen to translate. Each item in the list box can contain different file types (both for input and output), as well as different subdirectory locations, and different processing options—a great help in batch operations. One simple preference setting lets you save any error messages that may be generated to an error log for future inspection.

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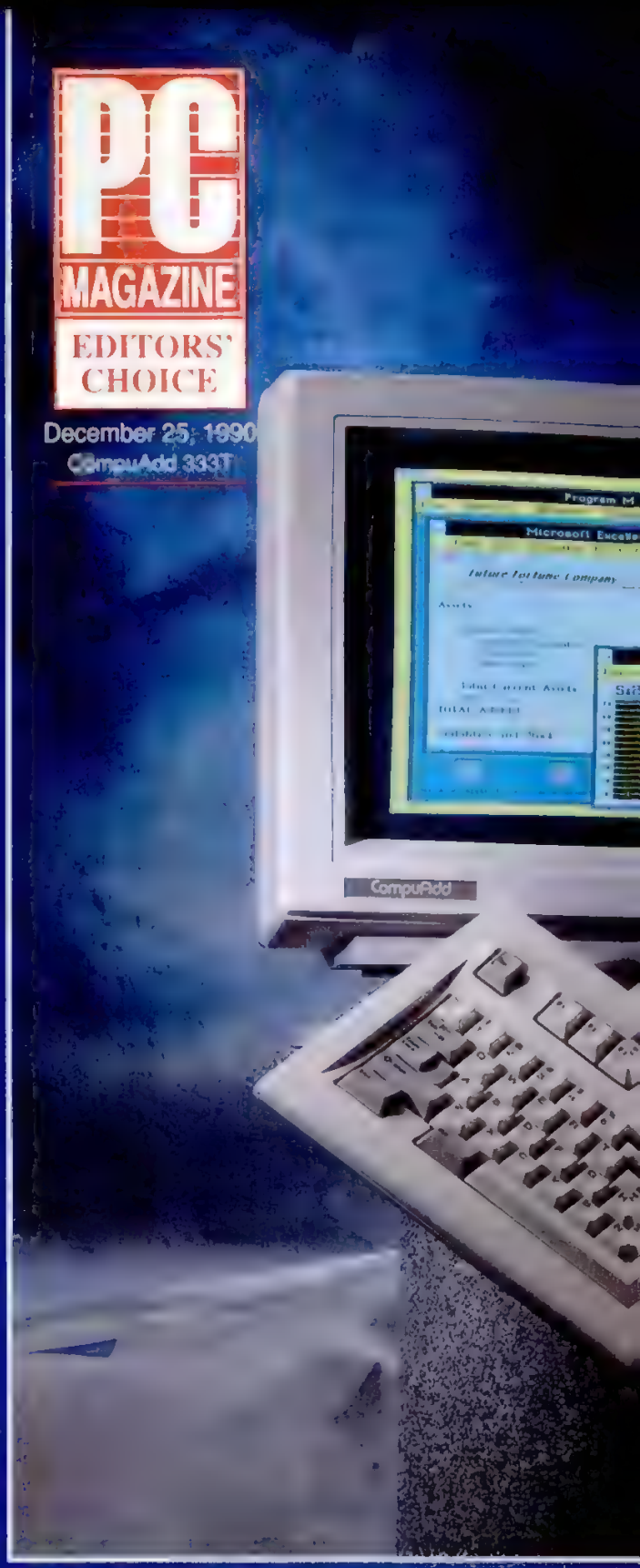

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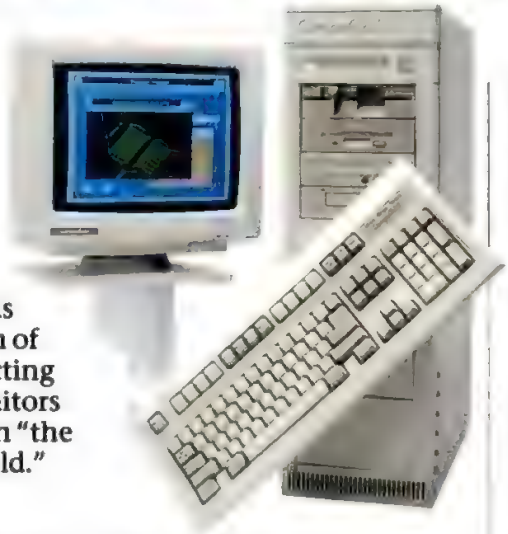

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To translate a file, you simply choose the source file type from the Input menu, the destination file type from the Output menu, and the various processing options from the Setup menu. Most of the options are self-explanatory, and vary according to the file format; for instance, you can choose to export either *Artline* or *Draw* flavors of .GEM, and either Pict1 or Pict2 flavors of the Macintosh standard. Others control the tradeoff between image accuracy and file size; for instance, if you opt to simulate the symbols in a source file as polygons, you can generate more precise (but larger) destination file.

Appropriately, *XPort* pays the most attention to CGM and .DXF files. If your graphics program proves to be incompatible with one of the five flavors of CGM

PROBLEMS OF VECTOR CONVERSION: Two Examples

by Rock Miller

Though vector images are made up of the basic entities, the gritty details can cause problems in conversion.

THROWING CGM A CURVE

The better vector drawing programs on the market today use Bezier curves, a highly efficient method of describing free-form curves mathematically. But older formats like .CGM and HPGL don't support Bezier curves. When images are translated into these formats, such curves must be simulated by using a series of arcs or line segments. This greatly increases the number of objects in the file, as each curve (defined by just two anchor points and two control points) is replaced with a large number of tiny segments.

To cut down on file sizes, vector conversion utilities allow you to choose the quality of the curve—that is, to control the relative number of segments that will be used to simulate it. With *HiJaak*'s CGM export facility, for instance, you can choose curve qualities ranging from ultrafine to coarse. The highest quality setting produces results that look very close to the original (Figure 1), but such a file can be monstrous in size. Reducing the quality setting to medium (Figure 2) cuts down the number of objects, but at the cost of less-than-appetizing appearance. Until Bezier or other complex curves are widely supported in standard vector file formats, however, this dilemma is inescapable.

Figure 1: Ultrafine-quality setting
Setting the curve quality to the highest setting gives a smooth curve, but creates a large file.

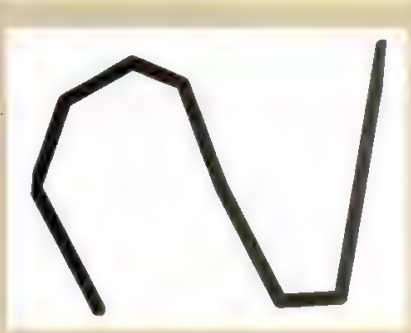


Figure 2: Medium-quality setting
Reducing curve quality, on the other hand, cuts down on file size, but gives poor results.

Figure 3: Original fill (EPS format)
The EPS format supports gradient fills, so you can apply a smooth transition to an irregular object.

Figure 4: Converted fill (CGM format)
When converted to CGM, however, banding occurs, and the fill can't be kept within the boundaries of the shape.

TROUBLE WITH FILLS

Gradient fills are widely used in slides, adding interest to backgrounds and accents to foreground objects. A vector format that supports gradient fills needs to store only the starting and ending color, and the direction or type of shading. The target application or output device then derives the proper fill at the highest resolution and number of colors it is capable of handling.

Since CGM files don't understand gradient fills, vector file-conversion programs have to improvise when converting them to this format. The most common method is to replace a filled object with a large number of smaller objects, each with a slightly different color. This greatly increases the number of objects that must be stored in the file, since a single fill attribute is replaced by a large number of narrow rectangles or concentric circles. The results often have an unpleasant banded quality, which is all too apparent regardless of the quality of the output device. Gradient fills on irregular objects (Figure 3) can also cause problems when converted to CGM format; notice how the fill in the CGM file (Figure 4) does not stay within the bounds of the irregular shape but appears as a rectangle superimposed on the outline. ■

VECTOR FILE FORMATS: TABLE OF ELEMENTS

A quick glance at this table of elements will reveal why vector file conversion is such a risky business. Most formats are designed for different purposes and support different sets of basic elements. And while some formats encompass vector information only, others (notably CGM, Macintosh Pict, and .WMF) are so-called *metafile* formats, which can include bitmapped information as well as vector objects.

Vector conversion programs must make complex decisions about how they will handle discrepancies between formats. The CGM format, for instance, does not support gradient fills, so conversion programs typically simulate them by creating multiple discrete bands of gray. Similarly, though the *Windows* Metafile format supports gradient fills, it can only perform vector clipping with regular shapes like rectangles. Irregularly shaped gradient-filled polygons, therefore, must be converted into an outline of the free-form shape surprinted on the graduated color.

Subtle incongruities between formats are more difficult to identify. The .DXF, .CGM, and .GEM formats all support basic geometric objects like circles, but they differ widely in their ability to handle complex mathematically defined shapes such as Bezier curves. Different formats also support different types of attributes. The CAD-derived .DXF format supports dotted or dashed line style attributes, while the WMF format describes lines in terms of their width and color.

The improvements that updates bring cause problems of their own. The latest version of *Micrografx Designer*, for instance, supports Bezier curves, but *XPort* doesn't include Bezier information when it creates a .DRW file. Similarly, the Level 4 revision of the .GEM format can contain information understandable to the latest version of either Digital Research's *Artline* or *Presentation Team*, but not both, and any such file will utterly confound the older *GEM Draw*.

Just looking at a file isn't a good way to determine which descriptors are supported and which are simulated. A .PIC file, for

ATTRIBUTE SUPPORT

Vector file format	Company	Primary application	Graphics primitives	Line attributes	Hatch patterns	Coded text	Bezier curves	Embedded bitmaps	3-D objects	Associative dimensioning
.CGM Computer Graphics Metafile	**American National Standards Institute Inc.** 1430 Broadway New York, NY 10018 (212) 354-3300	Graphics file interchange	■	■	■	■	❑	■	❑	❑
.DXF Document Interchange format	**Autodesk Inc.** 2320 Marinship Way Sausalito, CA 94965 (415) 332-2344	CAD	■	■	■	■	❑	❑	■	■
.EPS Encapsulated Postscript	**Adobe Systems Inc.** P.O. Box 7900 Mountain View, CA 94039 (415) 961-4400	Publishing	■	■	❑	■	■	■	❑	❑
.GEM Graphical Environment Manager vector format	**Digital Research Inc.** P.O. Box DRI Monterey, CA 93942 (408) 649-3896	Illustration	■	■	■*	■	■*	■*	❑	❑
.HPGL Hewlett-Packard Graphics Language	**Hewlett Packard Co.** San Diego Technical Graphics Division 16399 West Bernardo Dr. San Diego, CA 92127 (619) 487-4100	Plotter control	■	❑	■	❑	❑	❑	❑	❑
.PIC Lotus Picture	**Lotus Development Corp.** 55 Cambridge Pkwy. Cambridge, MA 02142 (617) 577-8500	Printing and plotting for *Lotus 1-2-3*	❑	❑	❑	■	❑	❑	❑	❑
.Pict Macintosh Picture	**Claris Corp.** 5201 Patrick Henry Dr. Santa Clara, CA 95052 (408) 727-8227	Macintosh file interchange	■	■	■	■	■	■	❑	❑
.WMF Windows Metafile format	**Microsoft Corp.** Windows Marketing Group 16011 NE 36th Way Redmond, WA 98073 (206) 882-8080	Windows file interchange	■	■	■	■	❑	■	❑	❑

■—Yes ❑—No

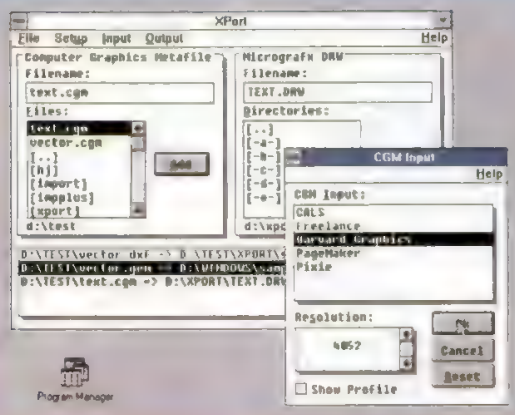
* Hatch patterns, embedded bitmaps, and indexed colors are supported only by Presentation Team.
† Bezier curves are supported only by Artline.

instance, may contain what looks like hatch patterns. But instead of one command creating the pattern, as in the .CGM format, each line in the pattern counts as a separate object and takes up a commensurate amount of memory.

Knowing the inherent differences between formats can help you to circumvent conversion problems—assuming, of course, that you have some control over the source image. There are two ways to educate yourself: You can spend some time studying the valuable technical information in the manuals supplied with all these products, or you can do some willy-nilly conversions—and learn the hard way.—**L.S.**

COLOR SUPPORT

	Color model	Gradient fills	Gradients on irregular polygons
Indexed or direct; no color limit		❑	❑
Indexed; 256 color		❑	❑
Direct; 24-bit RGB or 32-bit CMYK color		■	■
Indexed* or direct; 256 colors		■	■
8 pen colors		❑	❑
6 pen colors		❑	❑
Indexed or direct; 24-bit color		❑	❑
Indexed or direct; 24-bit color		■	❑



Micrografx *XPort*'s batch processing mode is quite flexible. Different subdirectory locations are allowed, and you can store unique translation parameters for each individual conversion.

that *XPort* can read and write (CALS, *Lotus Freelance*, *Harvard Graphics*, *PageMaker*, or Zenographics' *Pixie*), you can create and edit an custom version of the file specification by choosing between abstract or metric scaling modes, direct or indexed color specification, and 16-, 32-, or 64-bit coordinate systems. Creating your own flavor of CGM in this way doesn't require that you understand the programming concepts behind all these choices. All you really have to do is to ask the tech support department of the company that makes your software to tell you whether you have clicked on the right radio buttons.

TRANSLATION PROBLEMS

In theory, *XPort* allows you to determine the quality of a simulated curve in a CGM destination file. In our tests, however, this feature didn't work. The Bezier curve in our .GEM test file was recreated by *XPort* as the same series of coarse lines, regardless of whether the option was set at the lowest (1) or highest (10) quality level. I also found *XPort*'s use of different CGM sizing methods confusing. For CGM input, you must understand how to manipulate preset resolutions, but for output you must specify percentages instead. *XPort's* Macintosh Pict conversion was also highly problematic in practice. A patch provided by the vendor helped the initial quality problems, but did not fix them entirely.

Though *XPort* does not support three-dimensional objects in .DXF files (converting 3-D files results in strange, ghostly shapes), it does supply a host of other options. The .DXF file format supports the use of external shape libraries, and *XPort* can use these. It accepts dimensioning information, lets you reverse black and white to improve legibility, and lets you show invisible lines and block attributes.

Even for the formats it does support, *XPort* is a questionable value. It fails to take full advantage of the *Windows* environment, and the results of our test conversions, especially those from the Macintosh Pict format, were sometimes of inferior quality. *XPort*'s basic conversion functions are a duplicate of those found in Micrografx's other products, *Designer* and *Charisma*. On their own, they're hardly worth $199. ■

FACT FILE

***XPort*, Version 1.1**
Micrografx Inc., 1303 East Arapaho Rd., Richardson, TX 75081; (800) 733-3729, (214) 234-1769.
List Price: $199.
Requires: 1MB RAM, hard disk, DOS 2.1 or later, *Microsoft Windows* 2.1 or 3.0. EGA or VGA graphics adapter recommended. Mouse recommended.
In Short: Though *XPort* offers good CGM and .DXF support, its inflexibility and limited options make it a questionable value, particularly since all of its capabilities except for batch processing come for free with Micrografx's *Charisma* or *Designer*.

CIRCLE 611 ON READER SERVICE CARD

Paul Murphy *is a member of Singer Murphy Associates, a New Jersey land surveying firm, and a sysop on PC MagNet.* **Luisa Simone** *is a contributing editor of* PC Magazine.

LANtastic's™ tiny RAM now has more cards to play with.

If the presence of Micro Channel machines has ever stood between you and the joy of running the award-winning LANtastic PC Network, this is your lucky day. Artisoft has just added three new Micro Channel adapters to its compliment of AE-2 Ethernet, 2Mbps and Voice adapters.

LANtastic AE-2 MC Ethernet for Micro Channel, a 16-bit adapter that can be used in either a 16-bit or a 32-bit slot, is in 100% compliance with IEEE 802.3 and Ethernet standards, and comes with on-board 16K RAM that is user expandable to 64K. Since AE-2 MC Ethernet is software compatible with Novell's NE/2000 hardware, you can run Novell "out of the box."

LANtastic 2Mbps MC adapters are the perfect way to economically network small or midsize businesses with Micro Channel computers. Each card includes a 10Mhz coprocessor and 32K of on-board dual-ported RAM, along with software-selectable IRQ and RAMBASE address settings. Artisoft's version of the NetBIOS standard can be loaded into and executed within the adapter. This plunges the NetBIOS draw on a PC's base RAM down to just 2K and off loads the network processing onto the adapter. The cards are easy to install and use inexpensive dual-twisted pair cable.

LANtastic Voice MC adapters let you save sound and speech onto disk for playback later on Micro Channel machines. Use them with LANtastic NOS 3.0 or above, and you can send voice messages across your LANtastic network. Just pick up the telephone handset provided with each Voice Adapter, bring up a handy on-screen menu, and talk. Use Voice Chat to carry on a real time conversation, or save the message for playback later in your own voice – either through the handset or through the Micro Channel machine's internal speaker.

Now it's easier than ever to run LANtastic's award-winning Network Operating System on Micro Channel machines. Call 602-293-6363 or fax 602-293-8065.

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BUILDING WORKGROUP SOLUTIONS

ILLUSTRATION: JOHN LASSE

LAN BACKUP SOFTWARE

Flexible, full-featured backup software for network operations is in demand where system time is too precious to waste and files too important to lose.

by R. Dennis Boatner

There are two kinds of network administrators: those who have lost critical files and those who will. Experienced administrators don't have to be convinced of the value of making regular and frequent backups of their files. When you run a small network, its easy to back up to a single tape drive located on a client PC or on a server. But as your network grows, you gain more backup options and you need the freedom to use those options.

Modern networks can include several file servers, links to LANs in buildings across the parking lot or campus, links to mainframe computers, and networked client PCs with hard disks of substantial size. The administrator of one of these networks wants the option of using a mainframe, distant server, client PC hard drive, or any removable media—floppy, Bernoulli box, or WORM—to back up and restore data.

Companies that bundle backup hardware and software—and there are many of them—often lock you out of options. Typically, their software is closely tied to a specific tape controller and doesn't offer the choice of using just any networked device for backup.

On the other end of the spectrum, people with small networks of two to three PCs might be happy backing up only changed files to diskettes or a hard disk on the system. They don't want to be tied to one specific backup method either.

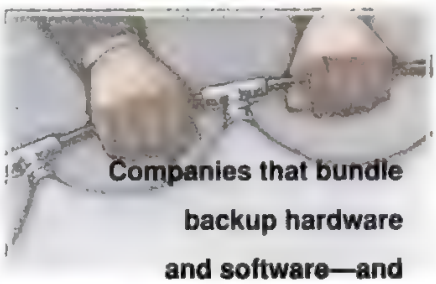
All LAN administrators face the challenge of having to back up hidden files, files that might be open, special file structures such as the database of *NetWare* users that Novell calls the Bindery, and files contained on client PCs.

For this review, we set out to find file backup software that is independent of hardware and capable of handling the unique problems faced by a network administrator—including backing up the *NetWare* Bindery. When we first started looking for LAN backup software, we found over 40 companies with integrated hardware and software packages, but this wasn't our goal.

Investigation left us with six companies that allow the user flexibility in selecting either a floppy disk, generic tape or WORM drive, an alternate hard disk drive, or any other named DOS device like other file servers. Of those six, two companies, Gazelle Systems and Sytron Corp., couldn't participate. Gazelle's *Back-It 4 LAN* and Sytron's *Sy-Tron Plus* were not available in time for our evaluation.

We discovered one product, *Distinct Back-Up*, a $129 *Microsoft Windows* product marketed by Distinct Corp. in Saratoga, California, too late for this review.

Three of the four remaining products, *DMS/IB* from Sterling Software, *TakeTwo Manager* from United Software Security, and Novell's *NBackup* all handle the chore of backing up by running as foreground application programs. Only *ARCServe* from Cheyenne Software addresses backup as a background task, allowing users to perform other jobs on their PCs instead of wasting productive work time.



Companies that bundle backup hardware and software—and there are many—often lock you out of options.

Of these four programs, *ARCServe* is the most flexible, since it allows both the file server and the workstation to execute backup and restore procedures from a predefined stored schedule without having anyone present. However, while *DMS/IB* and *TakeTwo Manager* sell for near-giveaway prices—in the neighborhood of $100 (*NBackup* is bundled with *NetWare*)—*ARCServe* starts at $1,195 and climbs to as high as $1,895, so you pay for the flexibility you get.

EDITORS' CHOICE

- **ARCserve 2.1C**

ARCserve from Cheyenne Software Inc. is professional software at a professional price. It has the flexibility to perform both attended and unattended backups and restorations using noncritical file-server time. This, combined with its transparent and automatic operation, makes it the best overall product tested for use in the file-server and workstation LAN environment.

Honorable mention goes to *TakeTwo Manager* from United Software Security Inc. Anyone with a smaller network to manage will appreciate the flexibility and the price. This software handles all DOS storage devices nicely, and its integration with the DOS functions gives it unique flexibility. If you don't need all the features of *ARCserve*, then *TakeTwo* can help you to keep your data safe for a very long time.

NOVELL BACKUP

We need to mention one important point for those not familiar with LANs. Backing up a Novell LAN has some peculiar problems. A Novell network contains a set of files called the Bindery. The Bindery is nothing more than a very elaborate database. It contains all the information about servers, users, rights of ownership on certain directories, resources (like printers, modems, and plotters) and various levels of security for the network.

When you back up your local hard disk, all DOS files are closed. This makes backup simple and easy. But the Bindery, unlike most DOS files, stays open while the network is operational. And when you attempt to back up an open file like the Bindery with most backup products like *PC Tools*, *Fastback Plus*, or the Backup program in *The Norton Utilities*, you get an error message—with the end result that the backup isn't made. Rebuilding the Bindery after a server crash can be a time-consuming, detailed, and embarrassing exercise.

Other questions revolve around how often you back up and where the backup software runs. For most people, the question of how often to back up is fairly simple. You pick an interval ranging from every night to once a week, depending on how often your files change and the degree of confidence you have in your equipment and its physical environment. However, some organizations lose money if they lose the record of even one transaction. For these companies, using a product able to do minute-by-minute backup of changed files, like Cheyenne Software's *ARCserve*, is a real option. However, this option leads back to the question of where you run the backup software.

All of these products, except Novell's *NBackup*, will run in a PC acting as a file server using a LAN operating system based on DOS such as Artisoft's *LANtastic*. All but *NBackup* will run on a DOS-based PC acting as a client on a Banyan *VINES* or Microsoft *LAN Manager* network, and they'll all run in a DOS-client PC on a *NetWare* LAN. Only *ARCserve* will run in the server under *Advanced NetWare 286* or *NetWare 386*. Even Novell's *NBackup* is a client PC application.

When backup programs run on the

Peter Norton's Philosophy On Data Recovery Can Be Summed Up In Three Little Words:

Never

Peter Norton

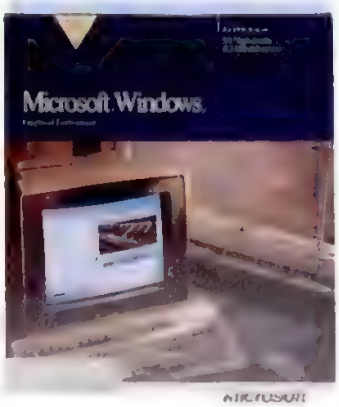
When it comes to your crucial data, Peter Norton just won't take **C>FILE NOT FOUND** for an answer. With programs like the Mace Utilities® and PC Tools,® data recovery is often mission impossible. But with the Norton Utilities® 5.0, data recovery is mission *critical*—and it can recover what no other utility can.

Data Recovery is serious business, which requires serious features. And the Norton Utilities has them all.

Norton Does Windows.

The Norton Utilities is *the* safe DOS utility program for use with windowing environments like Windows® 3.0 and DesqView.

Because PC Tools and Mace Utilities are blind to multitasking, they can irreversibly damage your files. While the Norton Utilities 5.0 offers three full levels of safety checks under Windows 3.0.



With a clear vision of the PC's future, the Norton Utilities 5.0 provides safe Windows 3.0 recovery.

Norton On Networks.

The Norton Utilities is the *only* utility program that provides Novell and DOS-compatible network recovery. So you can use *File Save* along with *UnErase*® to recover deleted files, or *File Fix*™ to reconstruct Lotus® 1-2-3® and dBASE® files. From any node on the network.

What's more, MIS will appreciate the Norton Utilities' compliance with existing network security restrictions.

System Information provides detailed reports on network information and TSR memory allocation, as well as graphical benchmarks of disk, CPU, network, and general computer performance.

DATA RECOVERY FEATURES	NORTON UTILITIES	PC TOOLS	MACE 1990
Number of DOS Error Messages With On-Line Advice	75	0	0
Different Types Of Data Loss Problems Solved			
File System Corruption	31	12	15
Physical Hard Disk Damage	6	0	0
Internal Data File Damage (i.e. dBASE, Lotus)	10	0	6
Disk Reliability Testing (Number Of Patterns)	80	0	0
System Information (Topics Reported)	94	15	16
NETWORK file recovery *When using File Save on Novell networks.	YES*	NO	NO
WINDOWS Safe Operation	YES	NO	NO
Failsafe Design	YES	NO	NO
Effective File Encryption That Does Not Require You To Change The Way You Work	YES	NO	NO

The next best thing to being there is being on the network. And the Norton Utilities 5.0 is the only data recovery tool that is.

Say Die.

Norton's Superior Recovery Technology.

Norton Utilities 5.0 Adds Features, Improves Interface
"Norton's disk utilities now surpass anything you can find in *PC Tools Deluxe* or *The Mace Utilities*, and offer safeguards you can't find anywhere else."
— PC Magazine 10/16/90

Don't just take our word for it, the proof is in the press.

The Norton Utilities handles the toughest data recovery situations easily—predicaments other utilities handle poorly, if at all.

Advise explains cryptic DOS error messages in plain English so you can understand the problem, and gives specific recommendations on how to fix it. So your valuable data is not at the mercy of risky trial-and-error procedures.

Unlike the competition, Norton recovery procedures are easy to use and completely failsafe. And because you can UNDO changes, you won't make a bad situation worse. In fact, while using the Norton Utilities your data will even survive a sudden power loss. All in all, it's the safest, most extensive diagnostic and recovery utility available.

And only the Norton Utilities gives you everything you need for optimal system performance. The new *Norton Cache* and the improved *Speed Disk*™ make your hard drive faster and more efficient. And *Calibrate*,™ which outperforms SpinRite,™ adjusts the interleave, identifies bad sectors, and even repairs demagnetized areas of your drive.

So get serious about data recovery. See your dealer for the new Norton Utilities 5.0 and get a free+ copy of the Norton Backup™ with purchase. To upgrade now call **1-800-343-4714** or fill out the coupon below. For more information, call **1-800-343-4714 Ext. 708** (in Canada, 1-800-465-2266). And in the immortal words of Peter Norton, "Never say die."

SYMANTEC.

+ $10 shipping and handling fee.

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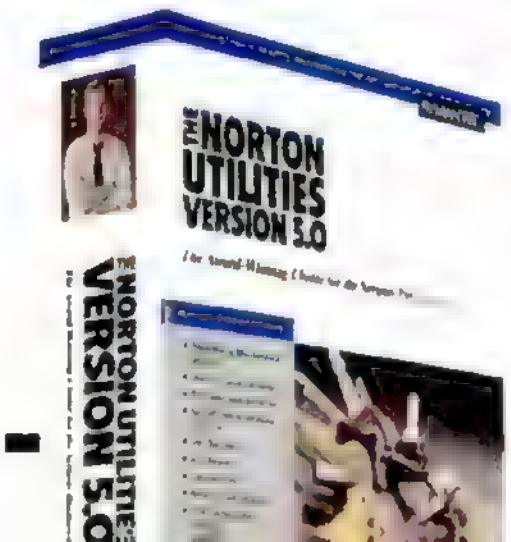
$59

Upgrade Now and Save $269!

Mace Utilities and PC Tools users can now get the Norton Utilities 5.0—list price **$179**—for **$59**. Which also includes a coupon for a *free*+ copy of the Norton Backup*—list price **$149!** Just send this coupon to Symantec, along with the title page from your Mace Utilities or PC Tools product manual. Send a check or have us bill your VISA or MasterCard $59 plus tax and $5 shipping and handling.

*Backup Offer expires January 31, 1991. Norton Utilities 5.0 offer expires February 28, 1991. Valid in U.S. and Canada only. Please allow 4-6 weeks for delivery. Only one upgrade per coupon. For multiple upgrades or POs, call 1-800-441-7234. For Canadian orders, call 1-800-465-2266.



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City/State/Zip _____

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All payments must be made in US dollars drawn on a US bank.

Name as it appears on your card (please print) _____

Acct. No. _____

Exp. Date ___/___ Day phone (___) _____

Quantity	Disk Size	Unit Cost
One	☐ 5 1/4-inch ☐ 3 1/2-inch	$59.00
In these states, add sales tax including applicable local tax: CO 3%; GA, IA, MI, NY 4%; MO 4.225%; IN, MD, MA, OH, WI 5%; DC, FL, MN, PA 6%; CA, IL, TX 6.25%; WA 6.5%; NJ 7%; CT 8%.		
Add shipping and handling:		$ 5.00
Total:		

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Other DAT products use adapted audio mechanisms. MaynStream 1300DAT was engineered from the ground up for the rigors of computer use. It features advanced electronics and silent operation. Plus an 11 megabyte-per-minute transfer rate and 5 megabyte-per-second burst mode.

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Depend on MaynStream 1300DAT for peer-to-peer networking. Novell®-certified MaynStream 3.0 software backs up your entire network, including file servers and workstations. On-disk tape cataloging provides quick restore of backup data to any network location.

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CIRCLE 495 ON READER SERVICE CARD

client PC, they drag all the data across the network to the client PC. If a client PC moves data from one server to another for storage, the data goes from the original storage location to the client PC and then back out from the client PC to the backup file server, so it traverses the network twice. This load doesn't matter if you're doing a backup when the network is idle, but if you elect to do frequent backups, the added network load can take its toll. Running the backup software on the server, either under *NetWare* or under a DOS-based LAN operating system, can reduce the network load if you make frequent backups.

The field of LAN backup software is wide open for developers. It's evident from these reviews that the companies need to find the right price point for their products—some are too high and some are too low to support effective marketing and technical assistance. But as the need for these products continues to grow, competition will improve the balance of price and features.

ARCserve

All reviews
by R. Dennis Boatner

Cheyenne Software's *ARCserve* can perform file-server and client-station backups to a central shared device such as a hard disk, optical drive, tape drive, WORM drive, or other available resource on your Novell network. It runs automatically either as a foreground application program or as an unattended backup and restoration program. The software allows you to manually back up and restore your files as well.

The version of *ARCserve* for *Advanced NetWare 286* sells for $1,195, and the *NetWare 386* version carries a relatively high $1,895 price tag. For an additional $1,000 in each version, a controller card can be had but is not necessary. Both packages include software and all the drivers for almost any device you will use for backup purposes, including drivers for SCSI and QIC-2 tape drives. For an additional $100, you can upgrade to Cheyenne's *ARCserveTAPE+*, a package providing an interface card for a tape drive.

ARCserve consists of two program modules: ARCserve Manager and ARCserve Server. The ARCserve Manager module runs in the workstation as a TSR so you can use other application programs simultaneously. The ARCserve Server module runs concurrently with *NetWare* in the file server.

Installing *ARCserve* is an automatic process. It loads as a VAP (Value-Added Process) on an *Advanced NetWare 286* network or as an NLM (*NetWare* Loadable Module) on a *NetWare 386* network. *ARCserve*'s VAP for *Advanced NetWare 286* permits you to back up *NetWare 386* file servers on the same network, while the *NetWare 386* NLM lets you back up all of the files on your 286-based systems. The 386 version lets you back up the extended file attributes of *NetWare 386*, but the VAP does not.

Novell LAN administrators will like the menu interface since it resembles FCONSOLE and PCONSOLE in Novell's *NetWare* and includes context-sensitive help.

ARCserve Manager includes features like job scheduling, queue management, and a database of backup transactions. Job scheduling allows the user to schedule three types of unattended operations: archiving, backup or restore from tape, and workstation archiving or backup. Each type of operation helps you back up your data in a flexible manner. Job scheduling lets you back up your data during slow times of day or night when your file server isn't working to capacity. It performs unattended file backups and even restores information to workstations while you're home asleep. With this feature, backup and restore operations take place in the background, unseen to the network user or operator.

The queue management feature allows the network supervisor to prioritize users or groups on a scale of 1 to 8 based on a number assigned by the LAN administrator. This lets you back up critical areas like payroll or cost accounting information first before backing up data at a less important workstation.

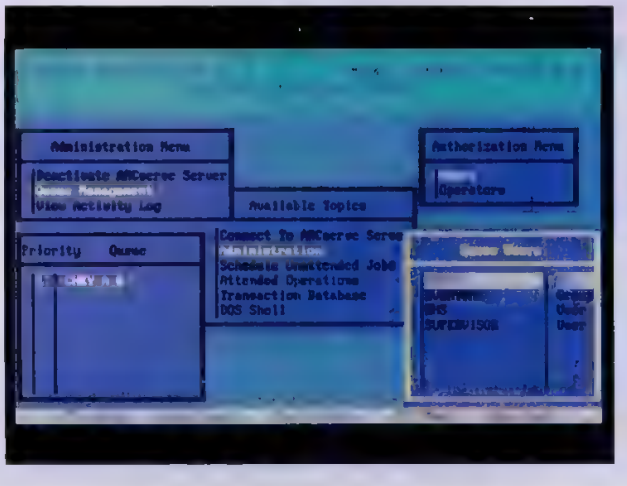
You'll find the transaction database contained in *ARCserve* helpful in logging all backup or restore sessions. You can generate numerous reports based on the information from the database.

ARCserve Manager has four methods of backup and archiving: complete, incre-

FACT FILE
EDITORS' CHOICE

***ARCserve*, Version 2.1C**
Cheyenne Software Inc., 55 Bryant Ave., Roslyn, NY 11576; (800) 243-9462, (516) 484-5110.
List Price: *NetWare 286*, $1,195; *NetWare 386*, $1,895. $100 upgrade to Version 3.0 available to registered users
Requires: PC-compatible workstation, 512K RAM, 400K hard disk storage space, DOS 3.1 or later, *Advanced NetWare* 2.1 or later for *NetWare 286*, *NetWare* 3.1*x* or later for *NetWare 386*, 100K RAM and 85K space on server.
In Short: The ability to perform scheduled backup functions in the background at any time makes *ARCserve* the more flexible and comprehensive package we tested. The price is high, but the cost-to-features ratio is outstanding.

CIRCLE 396 ON READER SERVICE CARD



***ARCserve*'s Administration screen details all authorized users, Priority Queue Management jobs, and displays a list of queue users and pending backup routines.**

mental-new, incremental by time stamp, and incremental by file access time. The complete method backs up all your files, all of the time. The incremental-new method backs up only the new files created since the last backup. If you choose incremental by time stamp, you'll back up only files changed since a certain date and time. The incremental by file access time method backs up only those files with changes after a certain backup time.

You can use a wildcard feature or a tree structure menu within *ARCserve* to include or exclude files and directories from the backup process. A server management feature permits activation or deactivation of ARCserve Server from any workstation, providing that you have supervisor rights on the network.

The attended operations feature allows you to archive, back up, and restore files manually. The user may perform an attended operation while an unattended operation runs simultaneously. During this procedure, you can access the database to

FINDING ELECTRONIC VAULTS AND NETWORK WONDERS

by R. Dennis Boatner

There comes a time in every organization when old files have to be put away for safekeeping, even though they'll probably never be needed again. There also comes a time when servers and the files on them have to be recreated or recovered because they are needed again. Our research of LAN backup software turned up two network utilities—United Software Security's *PC Librarian* and Cheyenne Software's *NetBack*—that archive, track, manage and restore files that just can't be lost or thrown away. These programs aren't full-blown backup software solutions, but each has special features outside those found in standard LAN backup software.

PC Librarian archives old or inactive files to a specific storage media while maintaining an index of those files on either the PC's hard disk or the network file server. In a sense, *PC Librarian* keeps a card catalog of your archived files for reference at a later date.

The program installation takes less than 2 minutes. With the on-line help facility, the archiving process is easily walked through. To specify the contents of a file, *PC Librarian*'s file description feature allows up to 59 characters to name and describe each individual file.

PC Librarian's pull-down menus display a variety of features to choose from. Its data compression feature saves storage space with up to 70 percent compression for data and .BAT files, and as little as 5 percent compression on .COM and .EXE files.

Once the program has stored your files, they can be reviewed within a tree directory. Changing drives on multiple-drive hard disks or file servers is as simple as typing in the letter of the drive. *PC Librarian*'s file encryption and password security features keep personal files secure for your eyes only.

The *PC Librarian* single-user copy sells for $99, but United Software wants to lure users through a special price of $69. United Software will refund the amount paid for the product within the first 30 days if the buyer is not satisfied.

While *PC Librarian* specializes in documenting and archiving files, Cheyenne Software's *NetBack* specializes in restoring crashed servers from the information stored in a file called the VaultFile. *NetBack* creates this file during initial setup so that you can access the information quickly to fix file-server problems or make changes to stored directories and files. *NetBack* uses VaultFile to access and create the server, as well as to restore files on it. The program also allows upgrades to *NetWare* without having to redo *NetWare*'s Bindery information.

NetBack provides in-depth reports, useful file management utilities, and flexible communications for network users. The program generates group listings by name, ID, or workgroup, and highlights each user's rights within a particular group. It also details information about file-server trustee assignments, the directory rights and privileges of users, and disk usage data such as a volume's capacity. The file management utilities allow users to archive files, pack and unpack data files, and delete old files and directories. In addition, it also permits format conversions between DOS and Macintosh files. This keeps all of the original file attributes similar on each platform.

NetBack's communications feature allows message broadcasts to users or groups on all network file servers simultaneously. When activated, *NetBack*'s Log feature can retrieve all sent messages, too.

Cheyenne's *NetBack* sells for $245—not a bad price considering the helpful network tools like VaultFile and the cross-platform DOS and Macintosh file conversion.

Each of these utility programs address different network needs. *PC Librarian* deserves consideration for a LAN requiring a strong archiving program. Where network-oriented functions concerning Novell's *NetWare* Bindery and strong reporting capabilities are preferred, *NetBack* is the way to go. ■

***PC Librarian*, Version 2.0;** United Software Security Inc., 8133 Leesburg Pike, # 380, Vienna, VA, 22182-2705; (703) 556-0007.
List Price: Single-user copy, $69; LAN version, $299. **Requires:** PC-compatible workstation, 512K RAM, DOS 2.1*x* or later. **In Short:** *PC Librarian* removes and archives inactive files from your PC while retaining a descriptive indexed catalog of files on your local hard disk.

CIRCLE 400 ON READER SERVICE CARD

***NetBack*, Version 2.0;** Cheyenne Software Inc., 55 Bryant Ave., Roslyn, NY, 11576; (516) 484-5110.
List Price: $245. **Requires:** PC-compatible workstation, 384K RAM, 300K file-server disk space, 180K for Command Line Utilities, DOS 3.0*x* or later, *Advanced NetWare* 2.0 or later. **In Short:** *NetBack* provides an integrated set of LAN utilities for *NetWare*, including reporting, file management utilities, and communications options for all network users. It restores crashed file servers, helps create new ones, and upgrades *NetWare* versions without rekeying the Bindery information.

CIRCLE 401 ON READER SERVICE CARD

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You can save time and money when you buy specially marked boxes of 3M diskettes.

Buy 10. Get 11. Not only do you get a free formatted* diskette, you'll also get a chance to see how a formatted diskette can save time without disrupting your work.

Think of your free, formatted diskette as one way to increase your productivity or your return on investment. Either way, it's shrewd business.

*Formatted for IBM PCs and compatibles. May be reformatted for non-IBM compatible computers.

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CIRCLE 213 ON READER SERVICE CARD

They Left out Features....

We Left out the COMMA!!

The only thing missing...

is the comma in the price. If you look at the chart on the right you will see prices charged by our competition. All but one contain a comma. DesignCAD 3D sells for $399.00. Period. No Comma!

In order to draw the complex pictures shown below it is desirable to have the following 3D features:

- **Interactive design with 3D cursor**
- **Blending of surfaces**
- **Boolean operations such as add, subtract, and intersection**
- **Complex extrusions**
- **Cross sectioning**
- **Block scaling**
- **On screen shading**
- **Shaded output to printers and plotters**

All of these competitors left out one or more of these desirable features in their standard package. They didn't forget the most horrible feature - the comma.

DesignCAD 3D offers **ALL** the listed features plus many more!

If DesignCAD 3D has the power to create the 3D objects shown below, imagine how it could help with your design project!

DesignCAD 3D sells for $399. We left out the comma. We didn't think you would mind!

PC MAGAZINE EDITORS' CHOICE
December 11 1990
DesignCAD 3-D Version 2.1

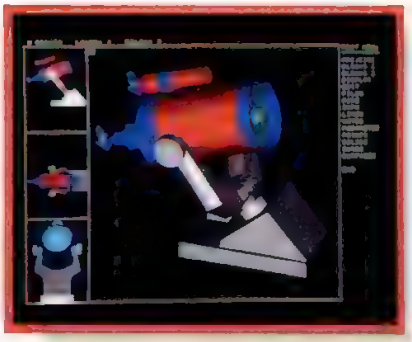
$399

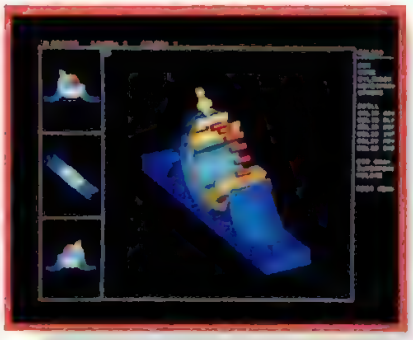
AutoCAD rel. 10	[illegible]	AutoCAD AEC $1,000.00 AutoShade $500.00
CADKEY 3.12	[illegible]	Solids $995 00 IGES translator $1,995.00
DataCAD with DC Modeler	[illegible]	DataCAD Velocity $2,000.00
DesignCAD 3D ver. 2.1	$ 399.00	[illegible]
MaxxiCAD 1.02	[illegible]	N/A
Mega Model	[illegible]	MegaDraw $195, List $295, MegaShade $395
MicroStation PC 3.0	[illegible]	Customer Support Libraries $1,000.00
ModelMate Plus 2.8	[illegible]	N/A
VersaCAD Design 5.4	[illegible]	N/A

Source: Byte Magazine

BYTE MAGAZINE SAYS...
"At $399, DesignCAD 3D was the least expensive package we saw, yet it was one of the more powerful. ..Don't be fooled by the remarkably low price, this program can really perform!"

Complete 3-Dimensional design features make it easy for you to construct realistic 3-D models. With full solid-object modeling capabilities you can analyze your drawing to determine the volume, surface area or even center of gravity! DesignCAD 3-D even permits you to check for interference between objects! Aeronautical Engineers can now find the center of gravity for a new airplane design with a couple of keystrokes. The Architect can determine the surface area of a roof for decking in a matter of minutes. The Civil Engineer can calculate the volume of a lake or dam in seconds. The Mechanical Engineer will know for sure if certain parts fit together without interference. The uses for DesignCAD 3-D are only limited by YOUR imagination!





HOW DO I GET ONE?

DesignCAD 3-D and DesignCAD 2D are available from most retail computer stores, or you may order directly from us. If you have questions about which program to purchase please give us a call. All you need to run DesignCAD 3-D is an IBM PC or compatible computer with 640 K RAM memory and a hard disk. Both products support most graphics cards, printers, plotters and digitizers. Free information and a demo disk are available by faxing (918) 825-6359 or telephoning:

1-(918) 825-4844

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CIRCLE 475 ON READER SERVICE CARD

gather needed information about a particular file or directory.

Cheyenne offers a one-year warranty with unlimited technical support. The technical support staff's hours are 8 to 5 P.M., EST.

Although this package has the highest selling price, it delivers many options not found in some of the lower-priced programs. These include multiple backups using the built-in queues and unattended backup operations. Cheyenne Software takes the drudgery out of backup and helps automate an otherwise time-consuming task.

NBackup

Novell had the foresight to include a LAN backup utility as part of its *Advanced NetWare 286* and *NetWare 386* packages. It's called *NBackup*, and you don't have to do anything extra to install it on your Novell network.

NBackup uses the exploding menu interface typical of *NetWare* utilities, and its features are basic but do the job of backing up data on your network. It moves selected data to either a DOS device like a floppy or hard disk, or to a Wangtek tape drive. *NBackup* can back up data files on a *NetWare 386* network but doesn't back up extended file attributes like .EXE, .COM, .BAT, or files with trustee rights located in the Bindery on your *NetWare 386* network. When Novell included this utility, its primary function was to back up the network until the user purchased a

FACT FILE

***NBackup*, Version 1.2**
Novell Inc., 122 East 1700 South, P.O. Box 5900, Provo, UT 84601; (800) 453-1267, (801) 379-5900.
List Price: Included with *Advanced NetWare 286* and *NetWare 386*; not sold separately.
Requires: *NetWare 286* or *386*, DOS 3.0 or later, hard disk, DOS device or floppy disk drive for backup.
In Short: Novell's backup utility program included with *NetWare 286* and *386* isn't well documented, but it performs all the basic backup functions.

CIRCLE 398 ON READER SERVICE CARD.

LAN BACKUP SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	Cheyenne Software Inc. ARCserve	Novell Inc. NBackup	Sterling Software DMS/IB	United Software Security Inc. TakeTwo Manager
LIST PRICE				
Single-user version	N/A	N/A	$100	$139
Multiuser version	$595 (*NetWare 286*), $895 (*NetWare 386*)	Included with *Netware*	$75 per copy (over 50 users)	$139
BACKUP OPTIONS				
Full	■	■	■	■
Incremental	■	■	■	■
Novell's *NetWare* Bindery	■	■	■	■
Open files	■	■	■	■
Hidden files	■	■	■	■
Copy-protected files	■	■	■	■
Include and exclude directories	■	■	■	■
Data compression	■	■	■	❑
Auto-backup for multiple drives	❑	■	■	■
Unattended backups	■	❑	❑	❑
Concurrent applications processing	■	❑	❑	❑
RESTORE OPTIONS				
Selected directories	■	■	■	■
Uses DOS Restore commands	❑	❑	❑	❑
BACKUP DEVICES				
Hard disk	■	■	■	■
Floppy disk	■	■	■	■
Tape	■	■	■	■
WORM drive	■	■	■	■
MEDIA				
Package defines capacity needed	■	❑	■	■
Media can be reused after backup	■	■	■	■
MESSAGES				
Alerts users when backing up open files	❑	■	❑	❑
Error message	■	■	■	■
REPORTS				
Backup	■	■	■	■
History	■	■	■	■
Detail history	■	■	■	■
File history	■	■	■	■
COMPATIBILITY				
Novell:				
Advanced NetWare 286	■	■	■	■
NetWare 386	■	■	■	■
Value-added process (VAP)	❑	■	❑	❑
NetWare Loadable Module (NLM)	❑	■	❑	❑
Other network operating systems:				
VINES	■	❑	■	■
LAN Manager	■	❑	■	■
DOS-based LAN operating systems	■	❑	■	■
OS/2	■	❑	■	■
MISCELLANEOUS FEATURES				
File management	■	❑	■	■
File encryption	❑	❑	❑	❑
Indexes backup materials	■	❑	■	■

—Editors' Choice ■—Yes ❑—No

N/A—Not applicable: The vendor does not offer a single-user version.

CONTINUES

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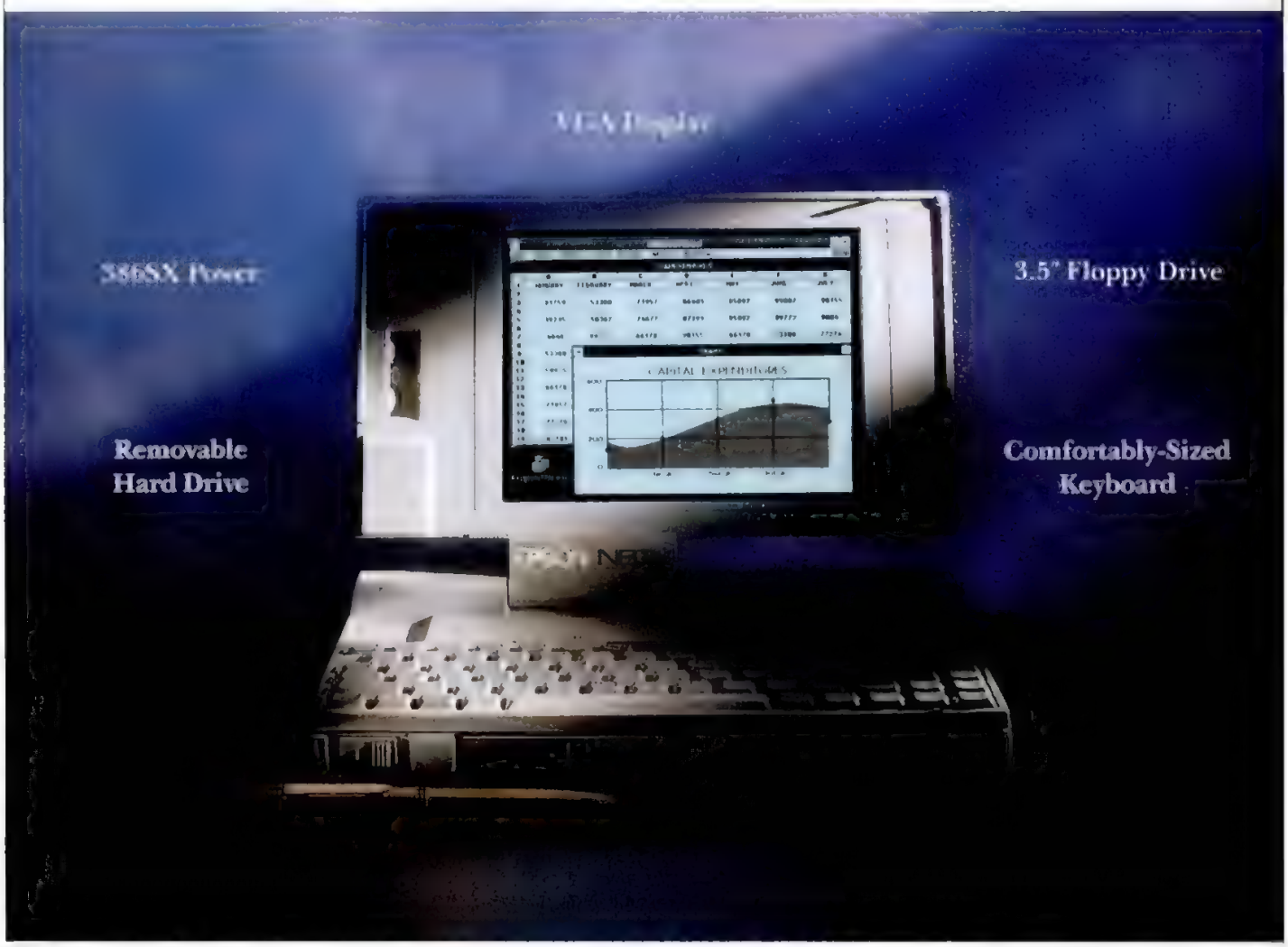

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more sophisticated program. At this time, there are no future plans for improvement. Novell's set of manuals doesn't go into detail about the *NBackup* utility, and you'll find it mentioned on only one page of the 286 maintenance manual.

NBackup requires little effort in installation and has on-line context-sensitive help screens. In fact, it installs automatically when you activate NETGEN, Novell's network generator utility.

NBackup has a menu-driven interface for easy selection of the file server for backup and customization of backup features. For example, on the program's second screen, the list of options includes whether or not to back up the Bindery information and the specification of the backup device. *NBackup* allows selection of any DOS device, such as hard and floppy disk drives, or other resources located on the network as a destination for the backed-up files. It also permits the user to include or exclude both files and directories. Also, you may select to back up or exclude hidden and system files or Trustees on the network.

NBackup offers both full and incremental backups. The full option backs up all your files every time. The incremental option backs up only those files altered since the previous backup. After the first complete backup, *NBackup* marks your files to assist with future incremental backups. The program broadcasts a system message to every client PC's screen during an operational backup session. Using *NBackup*'s menu-driven interface during restore lets you specify whether to restore a single file, a group of files, or even a specific subdirectory.

NBackup also keeps a log of each backup and restore session and of all the errors occurring during either operation. The session logging is handled like a card index system that shows the time and date of backup, along with the destination and items that you backed up. Explanations of error messages, such as Drive Not Ready or Disk Not Formatted, also appear in the log. You can print the logs to either the screen or your printer.

NBackup works only with *NetWare*. Warranty for this product follows the guidelines established by Novell and its Value Added Reseller network.

While the program is rudimentary in nature, it performs well. For simple backup needs, this utility fills a gap most other network software overlooks. Hats off to Novell for its foresight in network management.

While *NBackup* is rudimentary, it performs well and fills a gap often overlooked by network software.

LAN BACKUP SOFTWARE: SUMMARY OF FEATURES

Products listed in alphabetical order by company name

	Cheyenne Software Inc. ARCserve	Novell Inc. NBackup	Sterling Software DMS/IB	United Software Security Inc. TakeTwo Manager
SERVICE AND SUPPORT				
Warranty	1 year	1 year	90 days	1 year
Technical advice	■	■ (with contract)	■	■
Toll-free number	■	■	❑	■
BBS support	❑	■	❑	❑
Extended service contracts	■	■	■	■
Training	■	■	■	■

—Editors' Choice ■—Yes ❑—No

ENDS

***Netware's NBackup* utility's options include entries for subdirectories, trustees, files to include and exclude, whether to back up hidden files, the designated server to back up, and the backup destination drive.**

DMS/IB

After you've run a full backup with *Disk Management System/Intelligent Backup* (*DMS/IB*) you won't ever have to worry about it again. Why, you may ask? Because *Intelligent Backup* is truly intelligent.

After you perform the first complete backup, *DMS/IB* will ignore all files that haven't changed since your last backup—although you still have the ability to do a full backup through the *DMS/IB* menu interface. *Intelligent Backup* is a comprehensive program with a built-in hard disk file manager. The easy-to-use menu interface guides you along in backing up your hard disk to floppy disks, other hard disks, DOS-compatible tape drives, virtual disks, disk cartridges, and micro-to-mainframe virtual disks.

The installation was a breeze. *DMS/IB* has comprehensive on-line help screens to guide you through all aspects of the software. This is nice product for those of us who don't like to read the manual.

The *DMS/IB* menu interface presents a sharp, clean-looking screen with pleasing

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SCORE REPORT

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"Customer satisfaction is *the* strategic marketing concept for the decade."

— Manny Fernandez, Dataquest president

Dataquest called PC users like you — executives, engineers, business people, secretaries and technicians — people who buy and use PCs. Dataquest did not use manufacturer-supplied lists.

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* The Score Report: Personal Computer Customer Satisfaction Survey, by Dataquest, a company of The Dun & Bradstreet Corporation. Survey criteria conform to Malcolm Baldrige National Quality Award standards.

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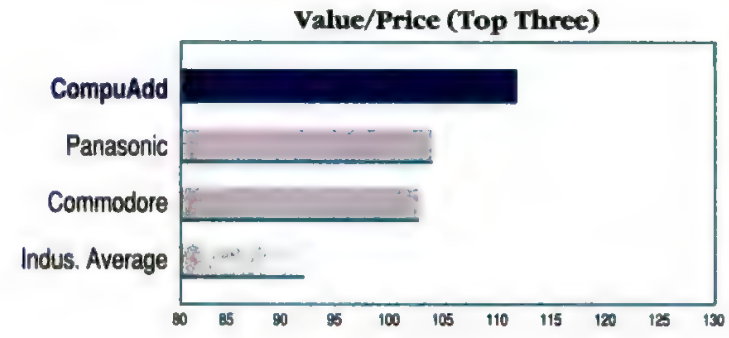
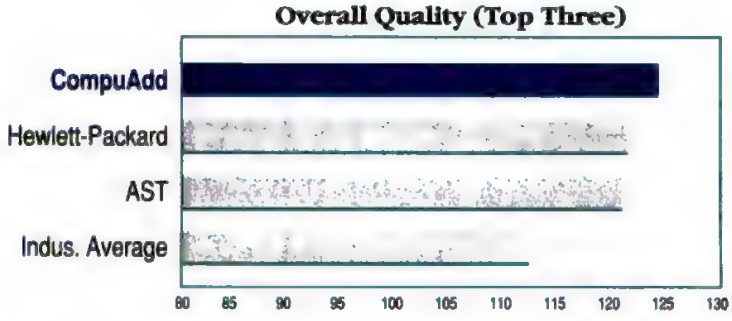
CompuAdd tops the list in value/price, quality and commitment to customers.

"Of the six categories, the survey found users feel the three most important areas affecting their satisfaction with a PC are: Value for price, quality and a company's commitment to its customers." — Dataquest

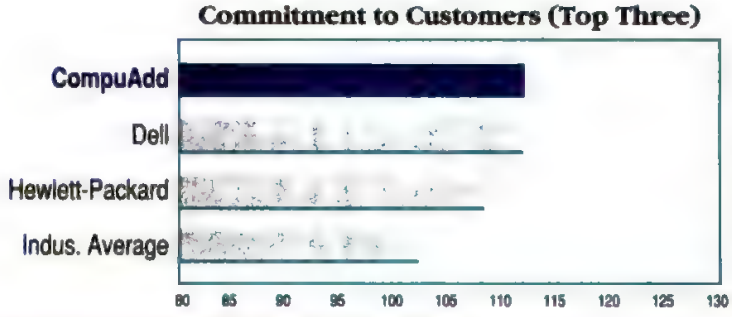


"Friends recommended IBM, but we bought two complete CompuAdds for the price of one IBM. We are very happy with our decision."
— James Courson, Texas'

"Your prices beat the socks off everybody!"
— Jerry Kelley, Kentucky'



"CompuAdd has always been good. Reliability is the key at CompuAdd!"
— Maudi DeWees, Maryland'



"Tech support is a 10!"
— Bob White, Wisconsin'

" Your company has gone out of their way to make me happy!"
— Steve Bockstein, Texas'

'Customer comments recorded by CompuAdd. Not drawn from Dataquest survey.

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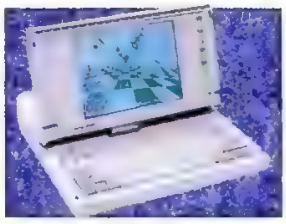

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12303 Technology, Austin, Texas 78727

FACT FILE

***DMS/IB*, Version 3.23**
Sterling Software, 1050 White Rock Rd., #100, Rancho Cordova, CA 95670-6095; (916) 635-5535, (714) 889-2663 for technical support.
List Price: Single-user copy, $100; for 50 users and more, $75 per copy.
Requires: PC-compatible workstation, 320K RAM, hard disk, DOS 2.0 or later.
In Short: In the multiuser arena, *DMS/IB* has a real grasp of how to back up data in various user configurations. Its ease of use, flexible interface with multitasking windowing software, and micro-to-mainframe links make *DMS/IB* a good buy for the bucks.

CIRCLE 397 ON READER SERVICE CARD

colors and simple commands. The on-line status screens created by the program keep you abreast of how far along you are in the backup operation.

After configuring your system, you can customize each backup session to fit your particular needs. You can change the destination drive, decide whether or not to use data compression, how often to back up, when to recycle your backup disks, and whether to include or exclude any files or subdirectories during backup. During installation, *DMS/IB* asks for your boot drive, checks your CONFIG.SYS file, then asks if you want to back up your files automatically, if backups are optional or required, and if you plan to use floppy disks for the backup session.

DMS/IB also features other program options including full, consolidated, and incremental backups. The full and incremental backups are standard fare, but the consolidated backup comes into play when *DMS/IB* figures out that your disk backup set is getting full. This procedure saves you 20 percent of the disk space you'd need for a full backup.

Unlike other hard disk programs, *DMS/IB* offers file maintenance and disk manipulation functions. These functions include copying, renaming, and deleting files, creating and deleting subdirectories, and changing file attributes. *DMS/IB* also has a full-screen editor that allows you to either browse or edit any text file.

The *DMS/IB* DOS interface lets you stop processing a backup to run any DOS commands. This is helpful if you're interrupted during backup and need to use your computer briefly for some other chore.

The program is compatible with DOS, all local area network environments, multitasking windowing software like *DESQview*, and micro-to-mainframe links giving it additional backup flexibility.

If you need to compress a large amount of data to fit a small storage area, you can use the data compression feature without tampering with DOS disk format compatibility. *DMS/IB*'s data compression, similar to PKZIP, varies between normal compression and super compression. The normal state delivers a 30 percent compression rate, while super compression brings the rate up to 70 percent. This can mean 400 to 450K of information on each 360K floppy and 1.3 to 1.5MB on each high-density 5.25-inch floppy.

You can execute *DMS/IB* as a TSR from the AUTOEXEC.BAT file on each workstation. As the TSR loads, it asks if you would like to back up. If you answer yes, it stops the AUTOEXEC.BAT file and performs the backup. Once it completes its backup process, the remainder of the AUTOEXEC.BAT file runs. If you answer no, it will remind you when you need to back up your data through a pop-up screen message during your initial boot-up. It also keeps track of deleted files from your hard disk and automatically formats floppies during backup.

DMS/IB keeps a complete backup index or database on both the hard disk and the backup media it uses. You can access the index through the menu interface by going into the Utilities section. Additionally, *DMS/IB* permits up to ten separate index database files for complex situations like multiple hard disks, LANs, and file transporting. Once you program all your special configurations, it saves them for future use.

DMS/IB also keeps history files. These history files don't replace the index files but augument the index by keeping track of when backups were done, how long it took, and the number of diskettes it used. The restore procedure is unique in that it allows the user to scroll a list of backed-up files and select a specific file for restoration. You also have the option of selecting either single or multiple files and/or directories during the restore.

***DMS/IB* allows selective restoration of single and multiple backup files or directories.**

Sterling Software sells its single-user version for $100 and offers corporate licensing starting at $75 per copy for quantities of 50 or more. The company warrants *DMS/IB* for 90 days with unlimited technical support. You can reach the technical staff by phone at (714) 889-2663 from 8 A.M. to 5 P.M. PST. Since most of the sales for *DMS/IB* are for multiple copies, Sterling offers extended service contracts for corporate customers.

DMS/IB's ease of use, menu-driven interface, and file management tools make this a full-featured backup program for both network file servers and PC-based workstations.

***DMS/IB*'s backup options include selections for source and backup drives, file options, number of backup disks, type of data compression, number of disks in backup set, and specified devices for backup.**

TakeTwo Manager

United Software Security's *TakeTwo Manager* is a nice $139 backup utility. It lets network users back up files from a network file server or standalone PC to any DOS-compatible device, including a double-sided 360K floppy disk, an external WORM drive, or another hard disk. It runs as a foreground application.

Installation of *TakeTwo* is a breeze. We spent little time setting up the program for our network because we used *TakeTwo* 's configuration default settings. To change the configuration settings, you simply use the menu-driven interface to perform the necessary changes. The manual gave complete and well-illustrated installation instructions. If you need help using the program, you can press the F2 key for the on-line help screens.

In order for *TakeTwo Manager* to work effectively, configure your backup routines during *TakeTwo Manager*'s initial installation. Each file on your hard disk requires a specified backup routine. The regular routine backs up the file each time you perform a full backup or when the file is changed. For a backup of program files or files that are rarely altered, you use the Once-only option. Selection of the Never option is reserved for files you don't want to back up, like copy-protected files.

TakeTwo Manager keeps the files in DOS's native format and allows you to restore your data using COPY or XCOPY. However, it's recommended that you back up and restore your files using the program's menu. To restore your data, you must go to the restore section of the main menu, mark a single file or directory, and press the F1 key to perform the restore.

TakeTwo Manager allows you to back up and restore your data using standard DOS commands. You can also restore and back up your files using the program's main menu. To restore your data, you must go to the restore section of the main menu, mark a single file or directory, and press the F1 key to perform the restore.

When you begin to back up files or directories to floppy disks, *TakeTwo* tells you the number of diskettes you'll need for the current backup process. As you back up your data, you will see your progress on the monitor's screen, and *TakeTwo* will prompt you when you need to replace the backup disk.

TakeTwo has a variety of management tools for tracking and working with files and directories. *TakeTwo*'s Smart Catalog indexes all of the backed-up files and stores them so you can track all the files backed up on the hard disk. With *TakeTwo*'s file management system, you can perform basic management functions such as moving, renaming, copying, deleting, and displaying all files and directories on the screen. *TakeTwo* also has a complete set of management reports, including a backup history report, a file configuration report, and a restore report.

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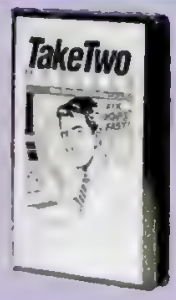

TakeTwo Manager,
Version 2.10b
United Software Security Inc., 8133 Leesburg Pike, #380, Vienna, VA 22182-2705; (800) 892-0007, (703) 556-0007.
List Price: $139
Requires: PC-compatible workstation, 512K RAM, DOS 2.1 or later, hard disk, DOS device or floppy disk drive for backup.
In Short: *TakeTwo Manager* fits the bill for simple LAN or PC backup software. Its ability to back up and restore archived files in native format using basic DOS commands, combined with its straightforward menu-driven interface and strong reporting features, make this program worth considering.

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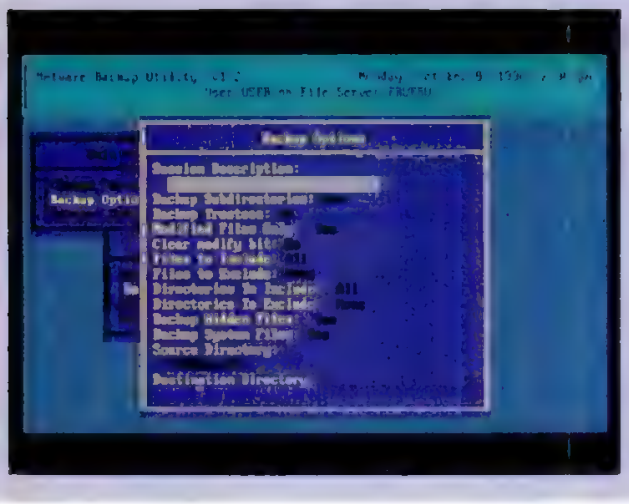
***TakeTwo*'s complete set of file management reports includes backup history, restore, and file configuration.**

If you run *TakeTwo Manager* in the applications mode, it requires 256K RAM to run on each workstation. The TSR file manager program included in the package requires an additional 256K RAM. This TSR helps to keep you from deleting the wrong file or the file you haven't yet backed up. You can load the TSR into high DOS to free up some RAM, but you may encounter some memory conflicts with programs like Quarterdeck's *QEMM* memory manager that try to access the same high-DOS memory region.

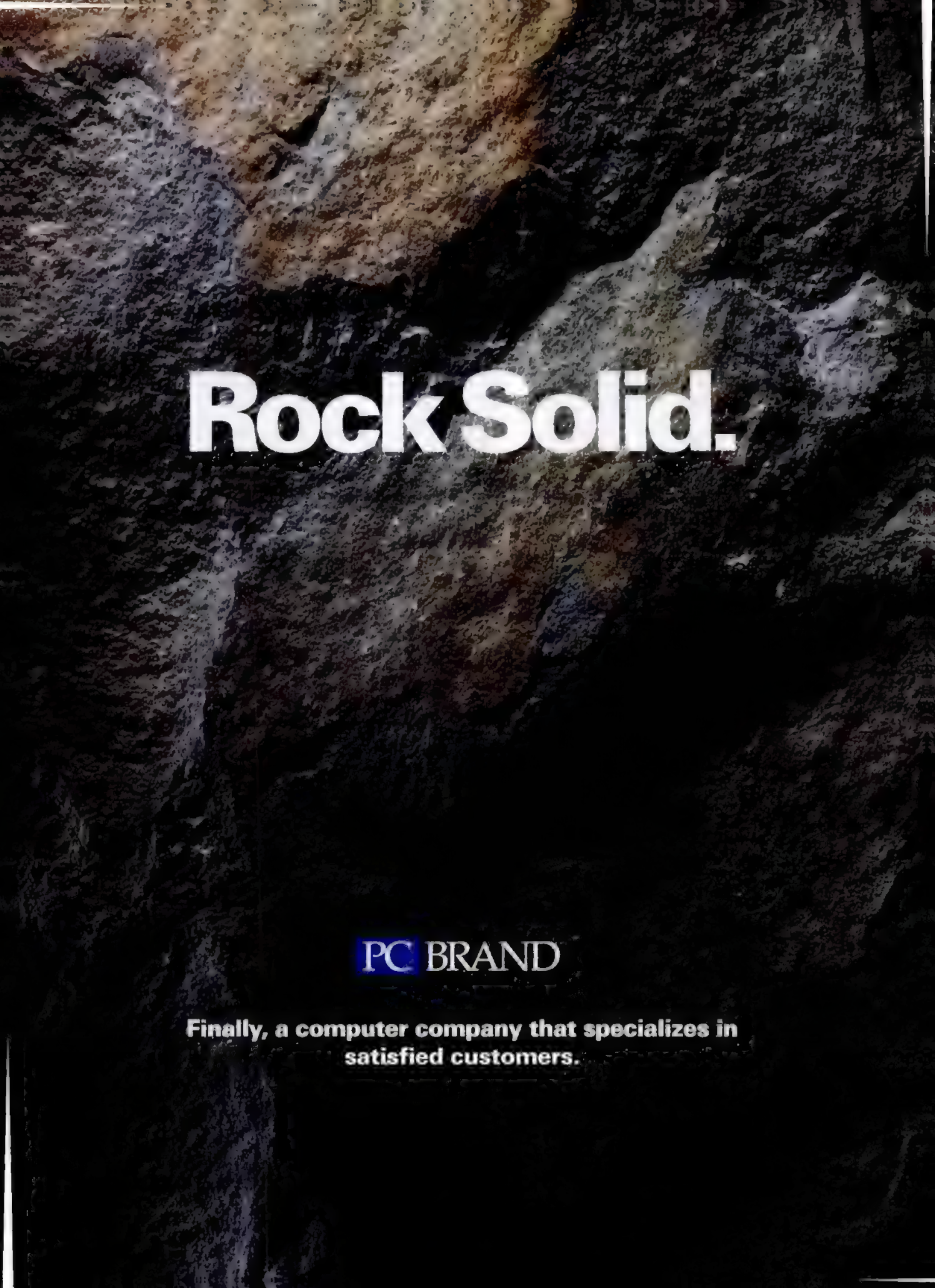
United Software Security offers a one-year warranty with unlimited technical support via a toll-free number. The company also markets *OnGuard*, a PC-access control software product with encryption/decryption recovery for hard disks. Yet another product, *PadPath*, allows you to link IBM mainframes running ACF2 security software to hand-held authentication devices for secured data.

TakeTwo provides a flexible menu-driven platform for backing up workstations or network file servers. The management reports and your ability to control the way you want to back up your data gives this product a position in the LAN backup race. ■



***TakeTwo*'s straightforward approach to backup shows in the way it presents information on the total number of directories, files, bytes, and number of floppy disks needed to perform a backup. Note *TakeTwo* Manager's prelabeled backup disk number.**

R. Dennis Boatner *is a computer consultant working in northwest Florida.*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"Not only does the system perform, look good and have competitive pricing, but it also has the "number-one" rated mail-order service and organization behind it. How can you go wrong?"

-Computer Monthly, PC Brand 286/16 Product Review

286/16MHz and 286/20MHz ISA Systems

286/16 and 20 Base Systems

Customize with the Video and Hard Drive options of your choice

- True 80286-16/20 w/ Zero Wait States
- Landmark Speed 20.6MHz *(286/16)*, 26.7MHz *(286/20)*
- Norton SI 19.0 *(286/16)* 23.0 *(286/20)*
- 512K RAM *(expandable to 8MB)*
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

16MHz **$549**

20MHz **$649**

286/16 and 20 Mono Packages

This preconfigured system includes all the features of our base system with:

- 512K RAM *(expandable to 8MB)*
- 40MB/25Ms Hard Drive
- 12" Mono Graphics Monitor
- Hercules Compatible Mono Graphics Card
- 1.2MB or 1.44MB Floppy Drive
- High Resolution Mouse

16MHz **$969**

20MHz **$1,069**

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PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Standard Features

- 80286-16, 80286-20 operating at 16MHz or 20MHz with Zero Wait States
- 512K RAM expandable to 8MB on the System Board
- 1:1 interleaved Hard/ Floppy Drive Controller, with 1MB second disk transfer rate
- 1 Parallel and 2 Serial Ports
- High capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery
- 80287 Co-Processor Support

Standard Features Cont.

- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, NOVELL,3COM, and PCNET compatibility
- Built in System Board LIM 4.0EMS hardware
- 7 Slot Motherboard Design (5 16bit & 2 8bit)
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options

- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640 x 480)
- Super VGA Color (1024x768)

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Rock Solid Warranty.

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Rock Bottom Price.

"The PC Brand 386/SX-16 performed at least as well as the far costlier Compaq... We simply began marveling at what is surely the best bargain in personal computing."

-Computer Buyer's Guide, 386SX-16 Product Review

386/SX-16 Non Cache and 386/SX-20 Cache ISA Systems

386/SX-16 Non Cache and 386/SX-20 Cache Base Systems

Customize with the Video and Hard Drive options of your choice

- True 386™SX™ Processor operating at 16MHz or 20 MHz with Zero Wait States
- Landmark Speed 18.3MHz *(386/SX-16 Non-Cache)*, 28.9MHz *(386/SX-20 Cache)*
- Norton SI 18.7 *(386/SX-16)*, 23.4 *(386/SX-20)*
- 512K RAM *(expandable to 8MB)*
- 16K CPU RAM Cache *(SX-20 only)*
- 1.2 MB or 1.44 MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

SX-16 $799

SX-20 $899

386/SX-16 Non Cache and 386/SX-20 Cache Super VGA Packages

This preconfigured package includes all the features of our base system with:

- 2MB RAM *(expandable to 8MB)*
- 40 MB/25Ms Hard Drive
- 14" Super VGA *(1024 x 768 Resolution)* Color Monitor
- 16 Bit High Performance Super VGA Card with 512K Video RAM
- Dual 1.2 MB and 1.44 MB Floppy Drives
- High Resolution Mouse

SX-16 $1,874

SX-20 $1,974

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Standard Features
- True 386™SX™ Processor operating at 16 MHz or 20 MHz with Zero Wait States
- 512K RAM expandable to 8MB on System Board
- 16KCPU RAM Cache (SX-20 only) with Posted Write and Writeback Logic
- 1:1 Interleaved Hard/Floppy Drive Controller with 1MB/second disk transfer rate
- High Capacity 200 Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery

Standard Features Cont.
- 1 Parallel and 2 Serial Ports
- 387™SX™CoProcessor Support
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, NOVELL, 3COM, and PCNET compatibility
- 8 Slot Motherboard Design (5 16bit and 3 8bit)
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Case Options
- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options
- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options
- Mono Graphics
- VGA Mono
- VGA Color (640x480)
- Super VGA Color (1024x768)

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Rock Solid Service,

Now 386's From $999

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Rock Bottom Price.

"The Best Low Cost Alternative Around"

-PC Magazine, 386/25 product review

386/25MHz ISA Systems

386/25 Base System

Customize with the Video and Hard Drive options of your choice

- True 25MHz Intel 80386 operating with Zero Wait States
- Landmark Speed 33.6MHz
- Norton SI 28.2
- 1MB Ram *(expandable to 16MB)*
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz $999

386/25 Super VGA Package

This preconfigured package includes all the features of our base system with:

- 4MB Ram *(expandable to 16MB)*
- 80MB/19MS Hard Drive
- 14" Super VGA *(1024 x 768 Resolution)* Color Monitor
- 16 Bit High Performance Super VGA Card with 512K Video RAM
- Dual 1.2MB and 1.44 Floppy Drives
- High Resolution Mouse

25MHz $2,333

All Systems also include: Free On-Site Service by TRW†, Our Unique 5 Year Warranty, Unlimited Toll-Free Service and Support, Our 30-Day No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

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Standard Features

- True 25MHz Intel 80386 CPU Operating with Zero Wait States
- 1MB RAM expandable to 16MB on the System Board
- 1:1Interleaving Hard /Floppy Drive Controller, w/ 1MB/ second disk transfer rate
- 1 parallel and 2 serial ports
- High Capacity 200Watt System Power Supply
- Real Time Clock/Calendar with 5 Year Battery
- 387™ or Weitek Co-Processor Support

Standard Features Cont.

- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, UNIX, NOVELL, 3COM and PCNET compatibility
- 8 Slot motherboard design (5 16Bit & 3 8Bit)
- Medium Foot Print Desk Top Case with 6 Disk Drive Bays

Case Options

- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options

- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options

- Mono Graphics
- VGA Mono
- VGA Color (640x480)
- Super VGA Color (1024x768)

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New Lower Prices On 386 Cache Systems!

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Rock Bottom Price.

"...Flawless Compatibility, Lowest Price."

-InfoWorld, 386/33 Product Review

386/25MHz and 386/33MHz Cached ISA Systems

386/25 and 33 Cache Base Systems

Customize with the Video and Hard Drive options of your choice

- True 25MHz or 33MHz Intel 80386 CPU operating with Zero Wait States
- Landmark Speed 43.5MHz *(386/25Cache)*, 58.7MHz *(386/33Cache)*
- Norton SI 31.6 *(386/25Cache)*, 45.9 *(386/33Cache)*
- 1MB RAM *(expandable to 16MB)*
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz **$1,199**

33MHz **$1,399**

386/25 and 33 Cache Super VGA Packages

This preconfigured package includes all the features of our base system with:

- 4MB RAM *(expandable to 16MB)*
- 125MB/19MS Hard Drive
- 14" Super VGA *(1024 x 768 Resolution)* Color Monitor
- 16 Bit High Performance Super VGA Card with 512K Video RAM
- Dual 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

25MHz **$2,704**

33MHz **$2,904**

All Systems also Include: Free On-Site Service by TRW†, Our Unique 5 Year Warranty, Unlimited Toll-FreeService and Support, Our 60-Day* No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

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Standard Features
- True 25MHz or 33MHz Intel 80386 CPU operating at Zero Wait States
- Direct Map Cache Processor with 64K static RAM standard expandable to 64K
- 1MB RAM expandable to 16MB on the System Board
- 1:1Interleaving Hard /Floppy Drive controller, with 1MB/ second disk transfer rate

Standard Features Cont.
- High capacity 200 watt System Power Supply
- RealTime Clock/Calendar with 5 Year Battery
- Industry Standard BIOS with full MS/DOS, OS/2, XENIX, UNIX, NOVELL, 3COM and PCNET compatibility
- 8 slot Motherboard design
- Medium Footprint Desktop Case with 6 Disk Drive Bays

Hard Drive Options
- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options
- Mono Graphics
- VGA Mono

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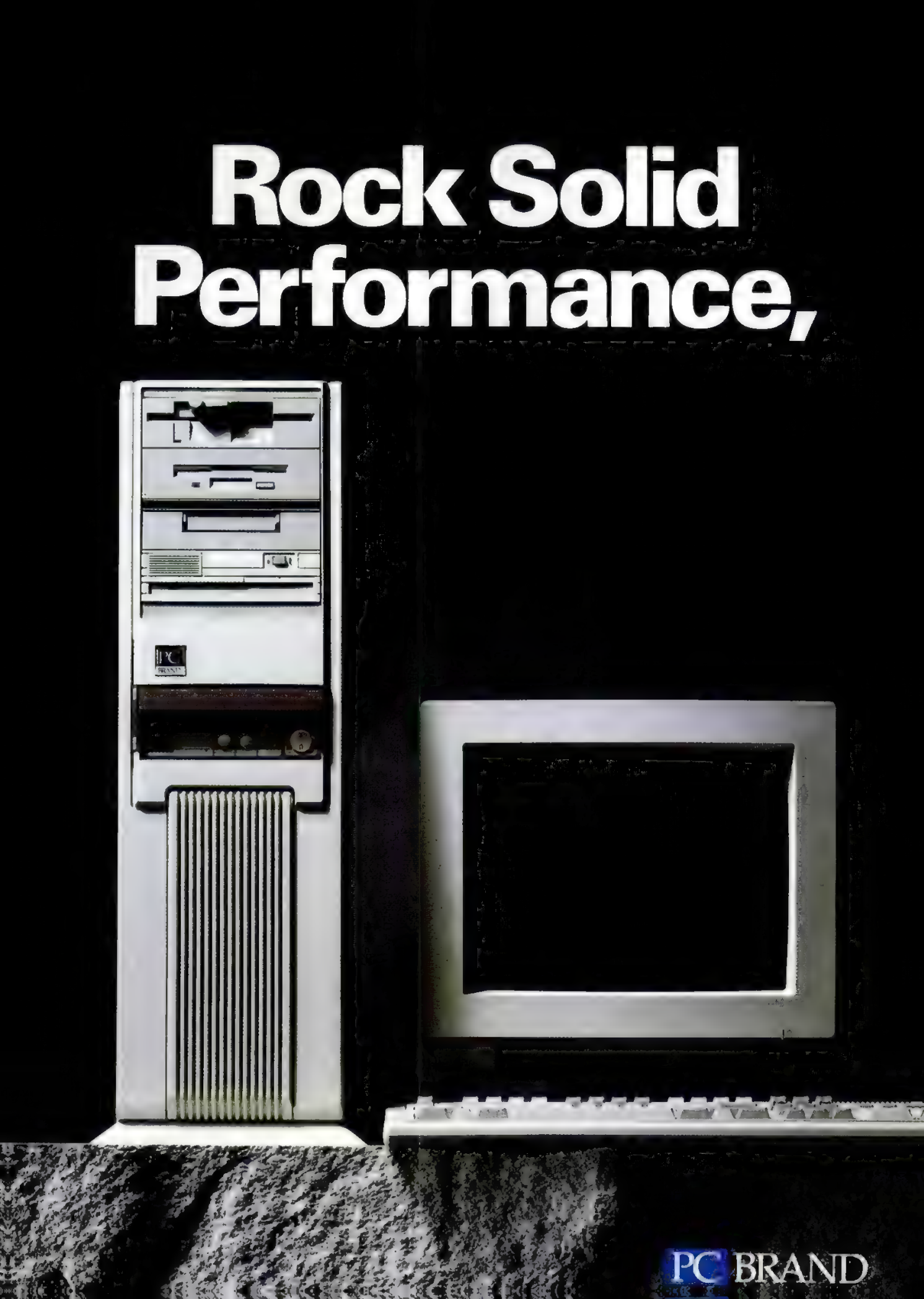

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486's Now Under $2,000.

"PC Brand is the L.L. Bean of Personal Computer Mail Order...PC Brand wants no unhappy customers... It's service and support policies help to insure that."

-Personal Computing, 10 Best Mail Order Companies

486/25MHz and 486/33MHz Cached ISA Systems

486/25 and 33 Base Systems

Customize with the Video and Hard Drive options of your choice

- True 25MHz or 33MHz Intel 80486 CPU operating at Zero Wait States
- Landmark speed114.1MHz *(486/25)*, 150MHz *(486/33)*
- Norton SI 41.5 *(486/25)* 51.5 *(486/33)*
- 1MB RAM *(expandable to 32MB)*
- 1.2MB or 1.44MB Floppy Drive
- 101 Key Click/Tactile Keyboard
- 1 Parallel and 2 Serial Ports

25MHz $1,949

33MHz $3,399

486/25 and 33 Super VGA Packages

This preconfigured package includes all the features of our base system plus:

- 4MB RAM *(expandable to 32MB)*
- 125MB/19Ms Hard Drive
- 14" Super VGA *(1024 x 768 Resolution)* Color Monitor
- 16 Bit High Performance Super VGA Card with 512K Video RAM
- Dual 1.2MB and 1.44MB Floppy Drives
- High Resolution Mouse

25MHz $3,454

33MHz $4,904

All Systems also Include: Free On-Site Service by TRW†, Our Unique 5 Year Warranty, Unlimited Toll-FreeService and Support, Our 30-Day No Risk Money Back Guarantee, Volume Purchase Discounts, and Tech Support Bulletin Board.

PC Brand Will Customize Any System to Your Exact Specifications, with name brand products from vendors like NEC, Paradise, ATI, Novell and many others, at outstanding prices. Call for quotation.

Standard Features
- True 25MHz or 33MHz Intel 80486 CPU operating at Zero Wait States
- 1MB RAM expandable to 32MB
- Built-in 8K 4-Way Set Associative Cache
- Built-in Intel 487 Numeric Coprocessor
- Optional 128K or 256K auxillary CPU Cache Card
- Optional Weitek Card
- 1:1 Interleaved Hard/Floppy Drive Controller with 1MB/second disk transfer rates
- 1 Parallel and 2 serial Ports
- High capacity 200 watt System Power Supply

Standard Features Cont.
- Real Time Clock /Calander with 5-year Battery
- 7 Slot Motherboard Design with one 32bit proprietary Zero Wait State Slot
- Industry Standard BIOS with MS/DOS, OS/2, XENIX, UNIX, NOVELL, and 3COM and PCNET compatibility
- Medium footprint desktop case with 6 disk drive bays

Case Options
- Slim Line
- Mini Tower
- Full Size Tower

Hard Drive Options
- 40MB/25MS
- 80MB/19MS
- 125MB/19MS
- 170MB/15MS
- 200MB/16MS
- 320MB/16MS
- 640MB/16MS

Video Options
- Mono Graphics
- VGA Mono
- Color VGA (640 x 480)
- Super VGA Color (1024 x 768)

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Rock Solid Quality

At PC Brand our mission is simple: to provide you with computer systems to your exact specifications; constructed with only top quality components from the industry's leading manufacturers; at an outstanding price. The Best in the Business.

PC Magazine said it best in a recent review:"...PC Brand machines are an efficient combination of in-house engineering and top-notch off the shelve parts..."

Infouvorld obviously agrees awarding their highest honor 'Recommended Product' with its quality seal of approval, to our 386/33 Cache Product.

Rock Solid Warranty.

The Best way we can stand behind our pledge to quality is to support it with the longest standing warranty in the Business. 5 Years.

Rock Solid Support.

The need for support installing specialized software, add-on peripherals, LAN's and the like is not a matter of *IF* you need it, but *WHEN*. Our job is to be there, when you need us, just a telephone call away to pitch-in and get your problem solved. That is our challenge and our commitment backed by the skills and service of some of the best technicians in the business, at your service through our unlimited Toll-Free Techline program. The Best in the Business.

Rock Solid Service.

In addition to our unlimited Toll-Free Techline, If your system requires a repair there's no need to send it back or carry it in, we'll come out to your site and fix it Free-of-Charge for any 386/SX, DX or 486 Computer.

Rock Bottom Price.

With PC Brand you deal direct. No middleman, no dealers, no distributors: no 'partners in profit' to boost up the price and give you nothing in return.

At PC Brand we take their share of the profit and give it directly to you in a lower system price and in better service and support. The Best in the Business.

This formula works! And it's why more experienced PC buyers are leaving the retail channel behind and joining the ranks of tens of thousands of Satisfied PC Brand Clients. Working with the Best in the Business.

PC BRAND™

Finally, a computer company that specializes in satisfied customers.

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POWER DIRECTORS

Convenience Plus Protection

Not just glorified power strips, today's power directors provide additional features like surge suppression, noise filtration, and power-line monitoring. These 16 models show how a good idea can evolve into a must-have for every PC user.

ILLUSTRATION: NORM BENDELL

by Walt Rowinsky

PC calisthenics. One: reach forward, turn on the computer. Two: bend back, turn on the printer. Three: twist and flick the modem's switch.

If you don't feel the need to limber up in the morning, or you feel that your morning power-switch lunge is undignified, you have two choices: grow tentacles like an octopus or get a power director.

At its simplest, a power director is nothing more than a power strip with each outlet controlled by its own switch. Put it on your desk, plug in your equipment, and you have ready control over what is and isn't on. At that simple level, it's a convenience item.

Evidently, manufacturers don't think a power strip is going to create much of a demand—even a glorified power strip. If a power strip is all you need, you can pick one up for as little as $10. So, to make a good thing better, just about every manufacturer in this review has added some real can't-live-withouts to their switch and outlet boxes. As a result, the typical power director reviewed here is designed to fit under a monitor, has built-in power-line surge protection and electrical noise filtration, contains a circuit breaker to protect from electrical overload, includes a way to discharge the static you build up when you walk across the office carpet, and has a list price between $100 and $170.

With this in mind, it's obvious that how well a power director can protect your equipment is a big part of making the choice. If you

PHOTOGRAPHS: WALTER CHRYNOWSKI

haven't already made some provision to protect your PC and peripherals from voltage spikes and surges, a power director is the most convenient way.

SURGE PROTECTION

Surges and spikes are two sudden voltage increases in your power line. They can be as drastic as what happens when lightning strikes a power pole in the neighborhood or as subtle as the voltage increase that briefly strikes your PC an instant after another machine plugged into the same circuit is switched off. (A slight sag in power also occurs when the same machine is initially turned on.)

If you're one of the thousands of PC users who aren't equipped with a surge protector of some sort, your PC may rank among the lucky majority that hasn't experienced a problem—or it may not. What voltage increases can do to your equipment is varied: everything from burning out your motherboard, in the case of a major surge, to causing lost pieces of data and erratic performance because of minor fluctuations. But even minor spikes and surges can cause permanent damage in the long run.

How much protection you're getting can be figured in terms of "pass-through voltage." That's the voltage that passes through to your system after the surge suppression's circuitry has done its work of cutting down the surge. The less voltage that gets through, the better.

Fortunately for buyers, Underwriters Laboratories Inc. established a standard in 1988 governing the capabilities of surge protectors. Called UL 1449, this specification sets up a series of steps ranging from 330 to 6,000 volts. 400 volts is about the most to which you'd want to subject your PC's delicate innards.

Not all of the power directors reviewed had a UL 1449 rating on their labels. Despite the fact that some companies will simply not buy equipment that isn't UL-approved, many manufacturers opt not to foot the high cost of UL testing. As a result, what's on their labels is what they have to live up to. All the products reviewed, however, listed a peak pass-through voltage that provides a point of comparison. And judging from these ratings, almost all weighed in under 400 volts. Those models that also have a UL 1449 rating are noted in the accompanying features table.

Electrical and radio frequency interference, or noise, can also affect your system's performance. Typical electrical noise is caused by running a motor—say an electrical drill—on the same circuit as your PC. Radio frequency noise is the result when your power lines act like a giant antenna introducing small fluctuations into the current coming out of the wall.

Providing basic noise filtration is simple, and a company would exclude it only as a sheer cost-cutting measure. Virtually all the power directors reviewed included some level of electrical noise filtration.

IMPORTANT EXTRAS

A number of the power directors reviewed have improved on the original idea by including phone line surge protection for an external modem or fax, other kinds of power line monitoring, or different approaches to power control.

Among the better ideas is Kensington Microware's MasterPiece Remote, which moves the outlets off the desktop and provides switching through a small wired remote control unit that can be hung on the side of your PC or monitor.

Kensington's MasterPiece Plus, Perma Power's Power Commander II, and SL Waber's Electronic Power Center/150 take the idea of power protection a step further by warning you when your voltage drops too low—a condition that could wreak havoc on your hard disk—or is too high but not to the point of surging.

MasterPiece Plus restricts itself to warning you of low voltage through a glowing LED and a very noticeable buzzer. The Electronic Power Center/150 extends this protection by shutting off power to its outlets in case of a brownout. Power Commander II takes the opposite tack and automatically shuts down when the voltage is continuously too high.

None of the power directors reviewed

PC MAGAZINE EDITORS' CHOICE

- **Kensington MasterPiece Plus**
- **Tandy Power Switching System**

The 16 power directors reviewed range in price from $70 to $325, and within that range there's plenty of variety in terms of functionality as well as power protection. You may opt for one of several products that we didn't select for Editors' Choice—if you need a specific feature such as remote operation, for instance—but Tandy's $100 Power Switching System and Kensington Microware's $160 MasterPiece Plus reflect feature sets that are bargains.

There's one question to ask yourself if you're considering the Power Switching System from Tandy. Namely, how do you beat a mid-range power director that has all the basics, includes an extra switchless outlet and a swivel base, at a sale price of $70—half the price of its nearest competition? The answer: you don't; you just go out and buy it. If you have to spend a bit extra for a separate phone-line surge suppressor, you still make out.

In the MasterPiece Plus, Kensington Microware Ltd. could have stopped with adding phone/modem surge protection while still offering good value for its $160 price. But the company went a step further and included power-line monitoring and a low-voltage warning system.

Low voltage can be a major factor in causing PC problems in older buildings and mazes of overloaded cubicles. And it's one of the last things people think to check for. The fact that Kensington offers low-voltage protection in a unit costing ten dollars less than competitors' products lacking this feature and a whole lot less than units with the same capabilities, makes the MasterPiece Plus an obvious choice.

Honorable mention goes to Kensington's $170 MasterPiece Remote, which addresses the PC user's unending quest for more desktop real estate. While the cable linking the control to the power strip will prove too short for many users, and the control hanger's adhesive strip may take more punishment than it can handle over time, the product's design is to be commended.

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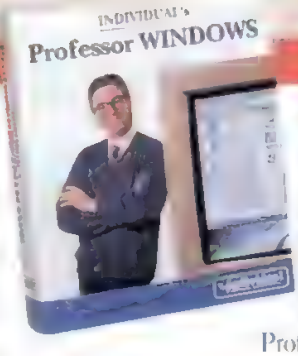

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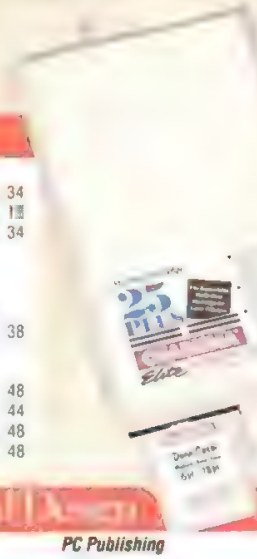

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went so far as to include a built-in voltage stabilizer or uninterruptable power supply. The introduction of those features in the future should not come as a surprise.

REVIEW CRITERIA

The 16 power directors included in this review represent power directors available from the major players in the market as of late 1990.

A number of the participating manufacturers chose to submit only one or two power directors that were representative of the rest of their product line. As a result, some notable products were not reviewed, the most intriguing of which is SL Waber's Electronic Power Center/400. This product combines features of the Electronic Power Center/150 and the Turn-On 1003-PC, the two Waber products reviewed here.

Most of the products included provide all the features found in a typical power director. Therefore, three other factors were taken into account in our evaluations: convenience, solidity of construction, and extras.

The whole point of buying a power director is to make turning on your system and peripherals more convenient. Short power cords, too few outlets, or poor placement of switches take away from that convenience.

Some extra features fall into the category of cosmetics, and don't really add anything to the usefulness of a power director; these include an LCD clock and a disk storage compartment. Other extras, such as additional levels of protection and swivel bases, make the difference between an average power director and one that stands out.

Black Box Corp.
Power Control Center SP200A

Spare but solid, Black Box Corp.'s Power Control Center SP200A provides the functionality and basic protection you want in a power director plus a little extra.

The $170 SP200A's five rocker switches control six outlets. The master switch directly controls two outlets as well as power to the entire unit. The switches have a positive feel; they're either on or off. Red plastic inserts in the switches take the place of indicator lights to show when a switch is on.

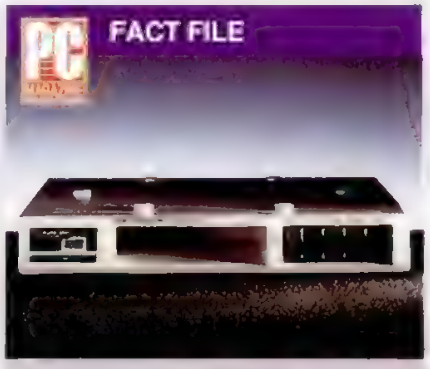
A small light immediately to the left of the switches glows when the Power Control Center is powered up; it will turn red if the internal surge protection circuitry is damaged or fails.

The rest of the front panel is taken up by a storage slot capable of holding ten 5.25-inch floppy disks and a small, battery-powered LCD clock. To replace the clock's batteries, you must remove a faceplate that holds it in place. This information doesn't appear in the power director's instruction sheets.

The outlets in the back are installed horizontally and about a half-inch apart. If they'd been installed so the slots were vertical, you would be able to plug in most modem transformers without blocking anything. As it is, you can use the rightmost outlet for a transformer after you've plugged your modem or fax wires into the Power Control Center's surge-protected RJ-11 jacks. (Unlike much of the competition, Black Box neglected to include a modular phone cable for use with the modem jacks.)

The remainder of the back is taken up by a reset button for the unit's 15-amp circuit breaker and a six-foot power cord—among the shortest of the products reviewed.

On top, nylon glides held on with sheet metal screws support a large swivel base, which moves smoothly and is sturdy enough to support any standard or even large-sized monitor. This product, in fact, is the only one with a swivel base that doesn't locate the swivel beneath the product.



Power Control Center SP200A
Black Box Corp., P.O. Box 12800, Pittsburgh, PA 15241; (412) 746-5500.
List Price: $170.
In Short: A solid, middle-class power director, it offers six outlets, substantial power protection circuitry, modem/fax protection, and a middle-of-the-pack price.

CIRCLE 411 ON READER SERVICE CARD

If your monitor is already equipped with a swivel, removing the Power Control Center's base plate is as simple as lifting it off. Removing the nylon glides takes a little muscle power and leaves a circle of holes in the top of the cabinet.

Internally, the power director's construction is as solid and no-nonsense as its exterior suggests. The metal case is connected directly to the power cord's ground, making it possible to use the entire case as a static eliminator. Two circuit boards hold the protection circuitry: a small one for the modem and a larger board with some substantial components for surge protection and noise filtering. The product has an excellent UL 1449 surge protection rating of 330 volts peak.

The Power Control Center is a workhorse, capable of providing all the control and protection many users will want. Although its $170 list price is a bit above the competition, this solidly built product is worth a good look.

Curtis Manufacturing Co. Inc.
Curtis Command Center SPF-4

Curtis Manufacturing Co.'s $150 Curtis Command Center provides all the essentials plus some thoughtful extras. What keeps this slim, plastic beauty from being the overall best choice is its light-duty status.

Its rated load limit of 10 amps is less than that of most of the power directors reviewed and places a practical limit on the number and kinds of peripherals you'd want to plug in.

The front of the Command Center is occupied by five large, illuminated push-button switches, a door for the 5.25-inch disk storage compartment, and two power-protection status lights. Each of the switches, including the master switch, directly controls one of the power director's five outlets.

The thoughtful touches begin with the static eliminator bar built into the master switch. Getting rid of static, after all, is an automatic part of turning your system on. What better place to locate this necessary function?

The back holds five outlets, two modem/fax protection jacks, and a 7-foot power cord that may disappoint many users. The outlets are installed with their slots vertical, making it possible to plug in

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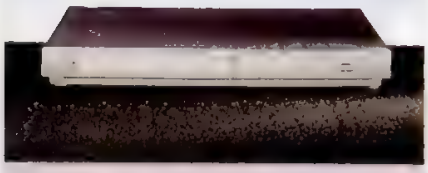

Curtis Command Center SPF-4
Curtis Manufacturing Co. Inc., 30 Fitzgerald Drive, Jaffrey, NH 03452; (800) 548-4900, (603) 532-4123.
List Price: $150.
In Short: Attractive and loaded with thoughtful touches, it's limited by its low 10-amp load rating. Still, it's a good choice if you're not going to plug in a lot of power-hungry peripherals.

CIRCLE 412 ON READER SERVICE CARD

a small modem transformer without blocking any of the other outlets. If that doesn't work, the power director comes with a handy 8-inch extension cord to handle the connection.

The labels for the outlets and jacks are embossed on the back edge of the power director's top. As a result, you don't have to turn the Command Center around to find that empty outlet.

Curtis even includes four extra rubber feet for the case if you decide you want to remove the swivel base. If you leave it on, you'll find that the power director swivels every time you push the master switch—because the switch is mounted near the right end. Moving it to the left of the other switches would solve the problem. (You'll hit the same problem when you open the product's disk storage compartment.)

Inside, there's a lightweight look to the way the circuitry looks and the way components are mounted. This doesn't mean, however, that you get shortchanged on power-line protection. The Command Center has a UL 1449 rating of 330 volts peak.

There are three circuit boards. One performs modem protection, one has the outlets mounted on it, and the third—the main board—handles surge and noise suppression.

The product's switches and indicator lights are mounted directly on the main circuit board. On our review unit, a potential problem was caused by two push buttons pushing against their indicator lights (within the unit) every time those switches were turned on or off. Eventually that could break the lights free or cause a short.

All in all, the problems are minor. You'll find the Curtis Command Center a good choice for light to average needs. Just don't expect to load it up and not trip the circuit breaker.

EFI Electronics Corp.
EDP-2000 TLS

A plain-Jane unit with only modem/fax surge protection and a foil static eliminator as extras, EFI Electronics Corp.'s EDP-2000 TLS is the same power director Black Box Corp. modified to produce its Power Control Center. While this product lacks Black Box's LCD clock and swivel base, it bears the same $170 list price.

Five rocker switches in the front control the six outlets on the back. The master switch does double duty: it directly controls two outlets at the same time it switches power for the entire unit. The switches have a no-nonsense feel and lack any sort of status lights but have the same red plastic inserts as the Black Box product to indicate on/off. To the left of the switches, a single LED indicator glows when power is turned on. This same indicator will turn red if the surge protection circuit fails.

The six outlets on the back are mounted a half-inch apart with their slots horizontal. Still, you could plug a modem transformer into the right-most outlet and only obstruct the modem/fax surge suppressor jacks. That won't make any difference once you've plugged in the phone wires. One more thing: EFI neglected to include a modular phone cable in the package—a small omission that's not justified by the price.

Inside, the construction and circuitry support the EDP-2000 TLS's solid image. Nothing is going to break loose or come apart unless you hit the case with a sledgehammer. The surge suppression circuitry has a UL 1449 rating of 330 volts peak, and the power director's maximum load is rated at 15 amps. Both ratings are as good you'll find in any power director reviewed here.

The EDP-2000 TLS is a workhorse, but overall you could probably find a better deal.

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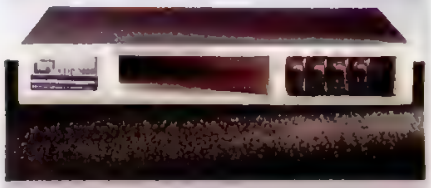


EDP-2000 TLS
EFI Electronics Corp., 2415 South 2300 West, Salt Lake City, UT 84119; (800) 877-1174, (801) 977-9009.
List Price: $170.
In Short: Essentially the same as the Black Box offering, it lacks the clock and swivel base but retains the solid industrial feel, solid surge suppression circuitry, and a too-short power cord. A good workhorse if you can find it discounted.

CIRCLE 413 ON READER SERVICE CARD

Kensington Microware Ltd.
Kensington MasterPiece

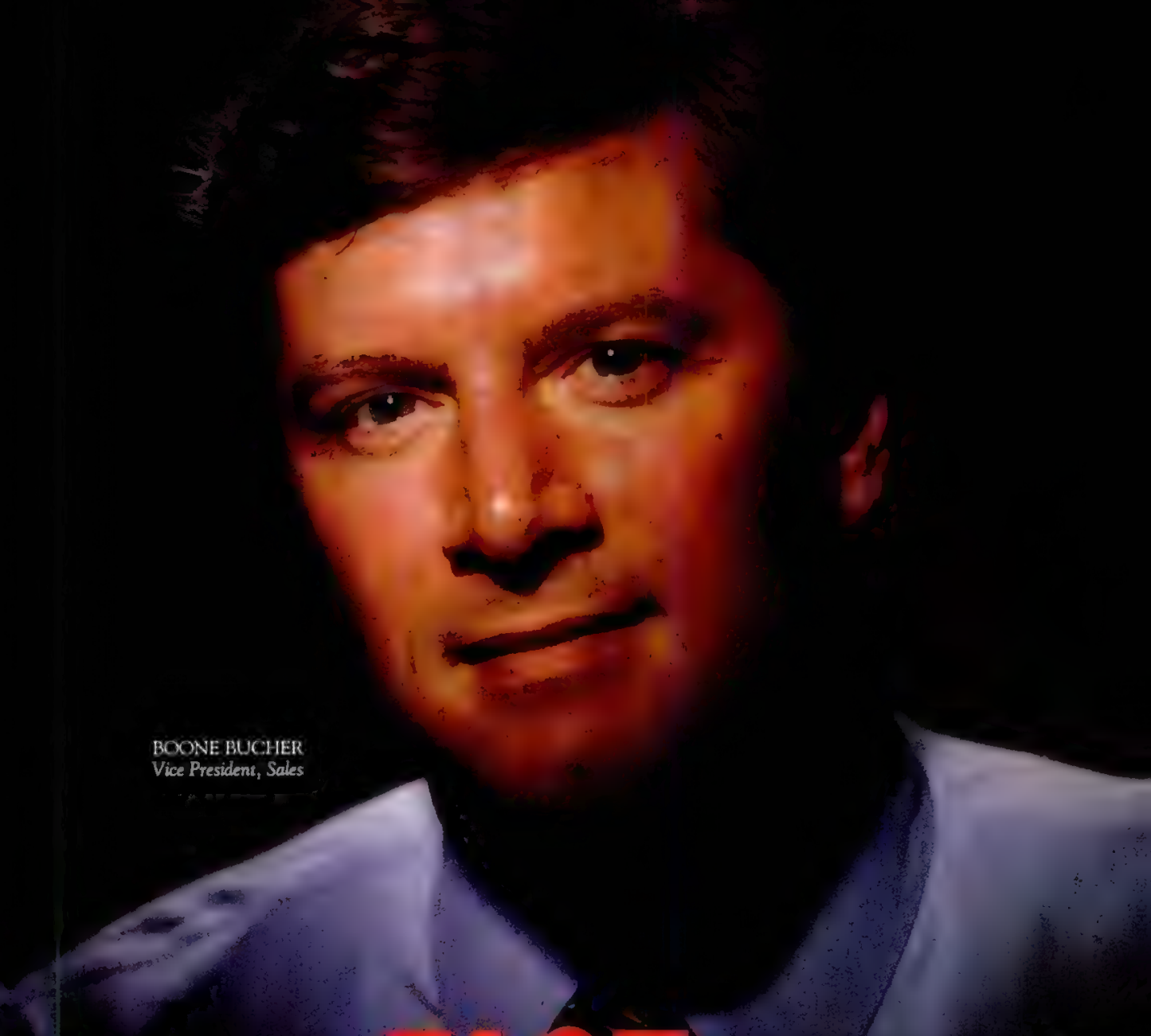
Plain and practical, Kensington Microware Ltd.'s MasterPiece is a good choice if all you're looking for is a basic power director. For an unremarkable $150, you get five individually switched outlets, respectable surge and noise suppression, and a removable swivel base.

Arranged across the front of the 1.5-inch-high case is a chrome nameplate that acts as a static eliminator, five large push buttons, and one indicator light corresponding to each button. The master switch is separated from the rest of the buttons by an extra indicator that glows while the surge suppressor is working. That separation could easily prevent you from accidentally turning off power to your system when you just wanted to turn off a printer.

The switches have a tentative feel to them. You have to make sure they've clicked on; otherwise, you get an annoying, if not potentially damaging, momentary contact.

The back of the MasterPiece holds only the clearly labeled outlets, the reset button for the circuit breaker, and a longer-than-average 8.5-foot power cord. The MasterPiece's 12-amp rating puts a practical limit on what you can have powered up at the same time.

The horizontally oriented outlets and the low height make it difficult to plug in



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CIRCLE 470 ON READER SERVICE CARD

FACT FILE

Kensington MasterPiece
Kensington Microware Ltd., 251 Park Ave. South, New York, NY 10010; (800) 535-4242, (212) 475-5200.
List Price: $150.
In Short: A good basic power director at a good price, but it lacks modem/fax protection and has a relatively light 12-amp load rating. For $10 extra, you can get a whole lot more with the MasterPiece Plus.

CIRCLE 414 ON READER SERVICE CARD

FACT FILE
EDITORS' CHOICE

Kensington MasterPiece Plus
Kensington Microware Ltd., 251 Park Ave. South, New York, NY 10010; (800) 535-4242, (212) 475-5200.
List Price: $160.
In Short: The price and extras make this one a winner. Its weakest feature is its 12-amp load rating, but that's not enough to detract from the overall value.

CIRCLE 415 ON READER SERVICE CARD

a modem transformer. Even if you don't end up blocking another outlet, there may not be enough clearance between the outlet and the PC or your desktop. Kensington recommends buying a short extension cord to take care of that problem, although a better answer would have been to include a short cord in the package.

The connections on the inside are neat and solid. A single circuit board provides surge and noise protection. Kensington rates the device at 330 volts peak.

The plastic case is well-reinforced and capable of supporting any standard monitor. The swivel base on the bottom slips off if you don't need it, and Kensington has thoughtfully provided four stick-on rubber feet to take its place.

Kensington Microware Ltd.
Kensington MasterPiece Plus

At $160, Kensington Microware Ltd.'s MasterPiece Plus shares the basic features, 330 peak voltage rating, strengths, and weaknesses of Kensington's MasterPiece, but its extra features make this the better choice of the two. In fact, the price makes it one of the better deals in power directors—the extra $10 above the price of the MasterPiece gets you modem/fax surge suppression, a low voltage detector, and a 7-foot modular phone wire.

The low voltage detector is hooked to an LED and buzzer to warn you when the power line voltage drops below 104 volts. This could be critical in protecting your hard disk from damage.

Inside, two circuit boards have been added: one for the modem/fax protection, the other for the product's low voltage detection circuit. Both have the same hardy look as the main circuit board. The buzzer is mounted in the bottom of the case and can be disabled by a switch next to the power cord.

The combination of power/modem surge protection and low-voltage warning puts the MasterPiece Plus on a level above most of the power directors reviewed. The 12-amp rating it shares with the basic MasterPiece is unfortunately on the light side, but this shouldn't disqualify it for use with many systems.

Kensington Microware Ltd.
Kensington MasterPiece Remote

Separating the power strip from the controls, Kensington Microware Ltd.'s $170 MasterPiece Remote wins the prize for innovative design. Full featured, this power director has got to be the choice for users who want to get some of the clutter off their desktop.

The power director's main component is a power-strip-shaped box with a generous 9-foot power cord. This you can keep on the floor or wherever you would ordinarily want your power strip to be.

The power strip includes five outlets, two modular phone jacks for the fax/modem surge suppression, and a female 9-pin connector for the wired remote control. Four of the outlets are switched, and one provides continuous power to your fax machine, clock, or anything else you don't want controlled by the master switch. The outlets are spaced about a half-inch apart. You won't block another outlet when you plug in a modem transformer.

Slots molded into the bottom of the power strip allow you to hang it on a wall, either in an upright or horizontal position. Kensington makes the job easier by providing mounting screws and a mounting template. Unfortunately, there are no rubber feet to keep the power strip from sliding around on a hard surface when it isn't permanently mounted.

The remote control, a 6- by 2- by 1-inch pad, connects to the power strip with a 7-foot control wire. The 7-foot length places a practical limit on where you can put the control in relation to the power strip, and it could easily create a problem in some situations.

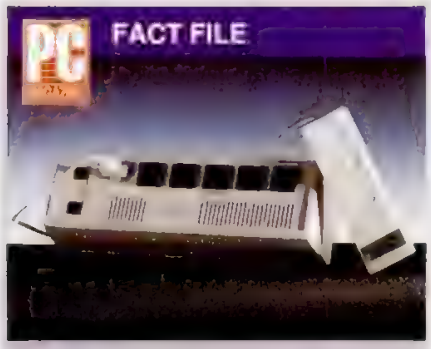
The remote control is designed to hang only on the right side of your monitor's or PC's case. The separate hanger is held on with an adhesive strip, and it must be attached to a flat surface. The manual warns you to allow the adhesive to cure for 48 hours before you put the remote on the hanger.

The adhesive strip looks like it will do the job, but only time will tell if it'll keep the hanger on over a long period of button-pushing.

There are only three large push buttons and four indicator lights on the remote. One of the indicators glows to show the surge suppressor is working. The master switch directly controls two of the four switched outlets, and the chrome nameplate near the bottom acts as a static eliminator. The pushbuttons need the same firm touch as the switches on the rest of Kensington's power directors.

The power director's weakest link is the remote's plastic case, which doesn't appear to be substantial enough to survive more than a few falls, which may be inevitable once the hanger's adhesive weakens over time.

A single circuit board is solidly mounted inside the power strip; all connections are neat and secure. The hardy



Kensington MasterPiece Remote
Kensington Microware Ltd., 251 Park Ave. South, New York, NY 10010; (800) 535-4242, (212) 475-5200.
List Price: $170.
In Short: The only choice if you want to keep anything but the essentials off your desk, but there's a price to pay in this remote's lightweight design.

CIRCLE 416 ON READER SERVICE CARD

components mounted on the circuit board give the impression that the surge protection provided is higher than the 395-volt peak at which Kensington rates it. Its 15-amp load rating should not limit the number or type of devices you plug into it.

Kensington Microware Ltd.
Kensington MasterPiece 400

The smallest power director reviewed in this roundup, the MasterPiece 400 from Kensington Microware Ltd. easily perches on top of a tower PC or attaches to the side of your desktop box. Its $100 list price reflects that size as well as its relatively light 10-amp load rating.

Filling the front are four large push-button switches with indicator lights and a chrome nameplate that doubles as the static eliminator touchplate. The switches, like the rest of the power directors in Kensington's line, have an inconclusive feel. You'll have to ensure they click all the way on, or else you only get momentary contact.

The back of the unit is devoted to the reset button for the circuit breaker, three outlets and a switched power supply cord (replacing one outlet) that you can connect directly into the back of your PC instead of using the PC's own power cord. The shortness of that cord limits the distance between the MasterPiece 400 and your PC, unless you take advantage of the adapter Kensington supplies to attach the cord that came with your PC. You're also limited by the skimpy 5.5-foot power cord—it's the shortest cord of any of the power directors reviewed and may prove inconvenient for many users.

Kensington includes an extra in the independently switched Aux 2 outlet. It's perfect for peripherals you want to operate separately from the rest of your system. That could be a desk lamp, a clock, or a fax machine that you need to keep on all the time.

The MasterPiece 400 is light. Unless the plastic case is physically fastened down, it's going to slide around every time you push a button. Fortunately, Kensington supplies a couple of strips of adhesive-backed Velcro so you can attach it to your PC or desktop.

Inside, a single small circuit board handles the surge and noise suppression duties, but it still supplies excellent protection. Kensington rates the product at 340 volts peak. Consider this one if you're running with the bare minimum of peripherals, but look elsewhere if you need more capacity.

Kensington MasterPiece 400
Kensington Microware Ltd., 251 Park Ave. South, New York, NY 10010; (800) 535-4242, (212) 475-5200.
List Price: $100.
In Short: Tiny, with four outlets and a 10-amp rating, this is strictly a light-duty unit. It's worth the price, but don't consider it if you need more capacity.

CIRCLE 417 ON READER SERVICE CARD

Perma Power Electronics Inc.
Power Commander RS 562

The Power Commander RS 562 qualifies as one of the top contenders among the power directors reviewed, largely thanks to its exceptional price. For $138, you get the basics: six outlets (five switched and one unswitched), a high level of surge protection, a rugged case, and a luxurious 12-foot power cord.

Six large, illuminated rocker switches take up most of the plastic front plate. The rest is taken up by a small static eliminator plate and a status light for the surge suppressor.

All the switches have a positive feel, cleanly clicking on and off. The master switch is separated from the rest, leaving little chance you'll accidentally hit it when you want to turn off a peripheral's switch.

Five of the six outlets on the back are switched. The sixth outlet is constantly on so long as the RS 562 is plugged into the wall. It's what you need if you have to keep a fax machine or a clock constantly powered.

The outlets are all installed so the slots are vertical. That, combined with the metal case's 2.25-inch height, makes it possible to directly plug in a modem transformer. Since the outlets are very close together, you may still block one of the outlets with the transformer. But with six available, that's less likely to be a concern.

A single circuit board on the inside handles the surge and noise suppression duties. Well-constructed with some respectable-looking components, it provides an excellent UL 1449 peak voltage rating of 330 volts. The connections and soldering are neat and solid, in keeping with this power director's rugged looks and 15-amp load rating.

A nice touch, overlooked by other manufacturers, is the inclusion of a set of stick-on labels that allow you to custom-label the switches and outlets. If Perma

Power Commander RS 562
Perma Power Electronics Inc., 5601 W. Howard Ave., Chicago, IL 60648; (312) 763-0763.
List Price: $138.
In Short: A great basic power director at an exceptional price. It will easily give you what you want, so long as your needs don't include modem/fax protection.

CIRCLE 418 ON READER SERVICE CARD

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CIRCLE 284 ON READER SERVICE CARD

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Power Electronics had thought to include modem/fax surge suppression, this would be an unbeatable deal.

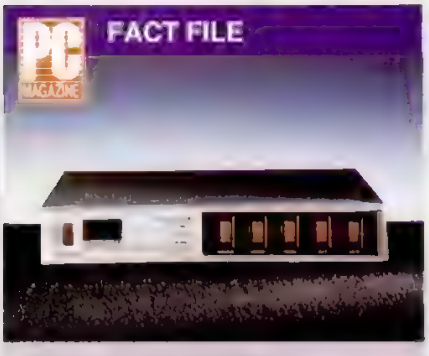
Perma Power Electronics Inc.
Power Commander II RS 562-4

Based on the Power Commander and sharing that unit's rugged construction, 330-volt UL 1449 rating and 15-amp load limit, Perma Power Electronics' Power Commander II RS 562-4 adds some critical levels of protection that help make it a superior product. You pay for that superiority with the product's $202 list price.

What the RS 562-4 adds is modem/fax surge protection and power-line monitoring with over-voltage protection. A vertical row of LEDs added to the front show the status of electrical current running from your wall socket: normal, low voltage, voltage too high, and over-voltage protection. That warning alone gives you an edge in protecting your PC and hard disk from potential damage.

If your power-line voltage is too high but not surging, the over-voltage light comes on and power is automatically shut off to your outlets. The power director stays on, monitoring the line voltage. Wait until the green normal light comes on, and flick the master switch off and on to reset the Power Commander II.

Inside, three additional circuit boards supplement the main surge and noise suppression board. One is for the fax/modem surge suppression, one handles the over-voltage sensor, and one maintains the line-monitor LEDs. A whisker wire from the LED board presses against the back of the static eliminator plate on the power director's face, providing an effective but delicate connection. That and the unit's high price are the Power Commander II's weakest points.



Power Commander II RS 562-4
Perma Power Electronics Inc., 5601 W. Howard Ave., Chicago, IL 60648; (312) 763-0763
List Price: $202.
In Short: Pricey but crammed with protection levels as well as all the basics. It's an excellent choice if you need to protect your system from a wide range of electrical threats.

CIRCLE 419 ON READER SERVICE CARD

Perma Power Electronic Inc.
Remote Controlled Surge Suppressor RW-500

For $100, Perma Power Electronic gives you a metal-clad power strip with a sensor outlet and a disappointing UL 1449 rating of 600 volts peak.

Of the five outlets on the RW-500, the switchless sensor outlet acts as the on/off switch. Just plug any handily located peripheral into it, say your monitor, and the rest of your system into the other four outlets. Every time you flick the monitor's switch, power goes on to all the outlets.

The sensor outlet's sensitivity is set to 25 watts. That will work with any PC, monitor, or printer (which all use above this level), and is set high enough to prevent the power strip from turning on if your monitor, or whatever you plug into it, tends to have a little current running through it even when it's off.

With a load rating of 15 amps, the RW-500 is able to handle most combinations of PCs and peripherals, but without better surge suppression, modem/fax protection, or individually switched outlets, the product's attraction is limited. The same price will get you much more from one of the other power directors.

Remote Controlled Surge Suppressor RW-500
Perma Power Electronics Inc., 5601 West Howard Ave., Chicago, IL 60648; (312) 763-0763.
List Price: $100.
In Short: A power strip that senses when you turn on a peripheral and then turns on the rest of your system. However, despite its 15-amp load rating, you can do a lot better.

CIRCLE 420 ON READER SERVICE CARD

Proxima Computer Accessories Corp.
Proxima Power Director Plus P15

For $160, the Proxima Power Director Plus P15 from Computer Accessories Corp. offers five switched outlets, modem/fax surge protection, solid power-line surge and noise suppression, and a short 7-foot power cord, all housed in a very attractive metal case. That's the extent of the standard offering, which puts this power director into the middle of the pack.

Five clearly labeled push-button switches and their indicator lights are crammed onto the right side of the plastic face. Taking up the left half is a nameplate that acts as a static eliminator, and there's also a small door to the 3.5-inch floppy disk compartment. The compartment can hold five disks or a small pack of tissues.

The Proxima's push buttons turn on and off cleanly, so you're not likely to get any annoying momentary contacts. The master switch is devoted to turning on power to the entire unit, but the CPU/monitor switch turns on two of the five outlets on the back.

The outlets occupy the same half of the box as the switches and have the surge-protected modem/fax jacks tucked in below. The overall effect is claustrophobic, and plugging in a modem transformer will also block one of the other outlets.

The other half of the back is taken up by a knockout panel. For an additional $70 to $150 (depending on the degree of functionality), you can install your choice of Proxima's peripheral-sharing switch boxes inside the power director. These would allow, for instance, the automatic or manual sharing of a printer between two or more PCs. If you need that feature, it's a great way to have it without cluttering up your desktop.

Inside, the soldering and connections are neat and solid. A single large circuit

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Most power strips offer little or no phone line data protection. MasterPiece Plus provides the highest quality EMI and RFI noise filtration combined with modem surge protection.

And MasterPiece Plus offers something no power strip can—fingertip control of each peripheral, plus a master switch that controls the entire system.

It even has a sturdy swivel base (detachable) that lets you adjust your monitor for the perfect viewing angle.

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So when it comes to total power protection and control, don't invest in anything but a MasterPiece.

MasterPiece Remote

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CIRCLE 220 ON READER SERVICE CARD

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NLQ (cps)	38	63
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Interface	parallel	parallel

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POWER DIRECTORS: SUMMARY OF FEATURES

Products listed in ascending price order

	Tandy Corp. Deluxe Power Center	Kensington Microware Ltd. Kensington MasterPiece 400	Perma Power Electronics Inc. Remote Controlled Surge Suppressor RW-500	Tandy Corp. Power Switching System 26-203A	Perma Power Electronics Inc. Power Commander RS 562	Tripp Lite Command Console CCI 6 Plus	Curtis Manufacturing Co. Inc. Curtis Command Center SPF-4
List price	$70	$100	$100	$100	$138	$139	$150
Dimensions (HWD, in inches)	2.1 x 4.3 x 10.5	1.8 x 7.4 x 5.7	1.8 x 2 x 15	1.9 x 12.8 x 13.8	2.3 x 13 x 13.3	2 x 12.8 x 13.8	1.5 x 13 x 13.3
Number of outlets	6	4	5	6	6	6	5
Number of switches	1	4	1 (sensor outlet)	6	5	5	5
Remote operation	■	❑	■	❑	❑	❑	❑
Surge suppression	■	■	■	■	■	■	■
Noise filtering	■	■	■	■	■	■	■
Phone surge suppressor	❑	❑	❑	❑	❑	■	■
Length of power cord (feet)	6	8	5.5	10	12	9	7
Uses circuit breaker	■	■	■	■	■	■	■
Rated power (amps)	15	10	15	15	15	15	10
UL 1449 listed	❑	❑	■	❑	■	■	■
Peak voltage	340	340	600	340	330	330	330
Special features:							
LCD clock	❑	❑	❑	❑	❑	❑	❑
Swivel base	❑	❑	❑	■	❑	❑	■
Static eliminator	❑	■	❑	❑	❑	■	■
Disk storage compartment	❑	❑	❑	❑	❑	❑	■ (5.25-inch)
Other	Adjustable sensor outlet	6-inch extension cord	Remote-on via sensor outlet	❑	❑	13-foot phone cable	8-inch extension cord

■—Editors' Choice ■—Yes ❑—No

board holds the substantial surge suppression, noise filtration and modem protection circuits. All connections and soldering are neat and solid, making it easy to accept the Proxima's UL 1449 rating of 330 volts peak.

Give this one some serious thought if you're not looking for any extra levels of protection.

FACT FILE

Proxima Power Director Plus P15
Proxima Computer Accessories Corp., 6610 Nancy Ridge Drive, San Diego, CA 92121; (619) 457-5500.
List Price: $160.
In Short: A good value as it is, the Proxima could prove to be a better deal with the optional switchbox installed; but it needs a longer power cord, and the outlets are too close together to plug in a transformer.

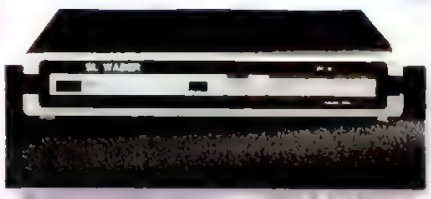
CIRCLE 421 ON READER SERVICE CARD

SL Waber Inc.
Electronic Power Center/150

Inside its attractive plastic case, SL Waber's Electronic Power Center/150 concentrates a solid level of surge and noise suppression and throws in an added brownout protection that makes the product worth its $190 list price.

Five push-button switches with indicator lights are crowded onto the right side of the Electronic Power Center's front. Each switch, including the master switch, directly controls one of the five outlets on the back. The switches have a good feel. In other words, you're not likely to press too lightly and get only momentary contact instead of powering on your system. Below the CPU switch, an extra "protec-

FACT FILE



Electronic Power Center/150
SL Waber Inc., 520 Fellowship Rd., Suite 306, Mount Laurel, NJ 08054; (800) 634-1485, (609) 866-8888.
List Price: $190.
In Short: This power director's strength is its brownout protection, but that alone doesn't move it out of the middle of this group. It could use an extra outlet and a longer power cord.

CIRCLE 422 ON READER SERVICE CARD

Kensington Microware Ltd. **Kensington MasterPiece**	Kensington Microware Ltd. **Kensington MasterPiece Plus**	Proxima Computer Accessories Corp. **Proxima Power Director Plus P15**	Black Box Corp. **Power Control Center SP200A**	EFI Electronics Corp. **EDP-2000 TLS**	Kensington Microware Ltd. **Kensington MasterPiece Remote**	SL Waber Inc. **Electronic Power Center/150**	Perma Power Electronics Inc. **Power Commander II RS 562-4**	SL Waber Inc. **Turn-On 1003-PC**
$150	$160	$160	$170	$170	$170	$190	$202	$325
1.5 x 13.8 x 13.5	1.5 x 13.8 x 13.5	2.3 x 14 x 15	2.3 x 13 x 15	2.3 x 13 x 15	Outlet: 3 x 3.8 x 12.5; control: 8.5 x 1 x 2	2.5 x 15 x 14	2.3 x 13 x 13.3	3.5 x 10 x 4.5
5	5	5	6	6	5	5	6	6
5	5	5	5	5	3	5	5	1
❑	❑	❑	❑	❑	■	❑	❑	■
■	■	■	■	■	■	■	■	■
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❑	■	■	■	■	■	■	■	■
8.5	8.5	7	6	6	9	6	12	6
■	■	■	■	■	■	■	■	❑
12	12	15	15	15	15	15	15	10
❑	❑	■	■	■	❑	■	■	■
330	330	330	330	330	395	400	330	400
❑	❑	❑	■	❑	❑	■	❑	❑
■	■	❑	■	❑	❑	❑	❑	❑
■	■	■	■	■	❑	■	❑	❑
❑	❑	■ (3.5-inch)	■ (5.25-inch)	■ (5.25-inch)	❑	❑	❑	❑
❑	Low-voltage indicator	❑	❑	❑	Remote control	Low-voltage protection, 7-foot phone cable	Power-line monitoring, over-voltage shutoff	Communications software, remote-on via phone

tion status'' light glows to show the surge protection is working.

The big bonus built into this power director is brownout protection. A sensor inside the case monitors power line voltage. If the power coming out of your wall drops low enough to threaten damage, the Electronic Power Center/150 shuts off power to its outlets.

If this occurs, power to the sensor remains on. A status light cues you when it's all right to start up your system again. Just press the reset switch on the faceplate, and you're back in business. (The reset button also has to be pressed to get the power director going when you first plug it into the wall.)

The rest of the front is taken up by a battery-operated LCD clock and a chrome nameplate that doubles as a static eliminator. To change the clock's battery, you have to pry off a small cover. This procedure is easy, but it isn't covered in the instruction book.

The outlets on the back are mounted with the slots positioned horizontally. They, the circuit breaker, and the disappointing 6-foot power cord are crammed onto the left side of the product. The jacks for the modem/fax surge protector are near the right end.

This arrangement makes it possible for you to plug a modem transformer into the right-most outlet without obstructing anything. The power director's 2.5-inch height provides enough clearance so the transformer isn't scraping against your desktop.

Inside, the components on the circuit board project a more lightweight image than you'd expect from the Electronic Power Center's UL 1449 rating of 400 volts peak. Though rated higher than most of the power directors reviewed, that voltage is still within an excellent range and provides adequate protection for your system.

What makes the product a contender is its brownout protection. Otherwise, at the Electronic Power Center/150's price, it could use an extra outlet, a longer power cord, and perhaps a swivel base.

SL Waber Inc.
Turn-On 1003-PC

At the same time it protects your system and modem from power surges and line noise, SL Waber's oversize aluminum power strip, called Turn-On, provides the answer to how to turn on your PC when you're nowhere near the office. At $325, however, it's a special-purpose device you should consider only if you need its singular abilities.

The power strip has six outlets and jacks for phone/modem surge suppression. Four of the outlets are for peripherals, one is dedicated to your PC and is powered two seconds after the other outlets, and the last is a sensor outlet that can act as the master on/off switch.

Turn-On lets you control your PC's power in two ways. First, plug your monitor into the sensor outlet, and Turn-On will switch on its five other outlets whenever you activate the monitor.

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40MB 1:1 Interleave	$3795	$3845	$3945	$4095	$4145	$4195	$4295
65MB 1:1 Interleave	$3895	$3945	$4045	$4195	$4245	$4295	$4395
80MB 1:1 Interleave	$4195	$4245	$4345	$4495	$4545	$4595	$4695
120MB 1:1 Interleave	$4295	$4345	$4445	$4595	$4645	$4695	$4795
160MB 1:1 Interleave	$4695	$4745	$4845	$4995	$5045	$5095	$5195
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30MB 1:1 Interleave	$2195	$2245	$2345	$2495	$2545	$2595	$2695
40MB 1:1 Interleave	$2245	$2295	$2395	$2545	$2595	$2645	$2745
65MB 1:1 Interleave	$2345	$2395	$2495	$2645	$2695	$2745	$2845
80MB 1:1 Interleave	$2645	$2695	$2795	$2945	$2995	$3045	$3145
120MB 1:1 Interleave	$2745	$2795	$2895	$3045	$3095	$3145	$3245
160MB 1:1 Interleave	$3145	$3195	$3295	$3445	$3495	$3545	$3645
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30MB 1:1 Interleave	$1695	$1745	$1845	$1995	$2045	$2095	$2195
40MB 1:1 Interleave	$1745	$1795	$1895	$2045	$2095	$2145	$2245
65MB 1:1 Interleave	$1845	$1895	$1995	$2145	$2195	$2245	$2345
80MB 1:1 Interleave	$2145	$2195	$2295	$2445	$2495	$2545	$2645
120MB 1:1 Interleave	$2245	$2295	$2395	$2545	$2595	$2645	$2745
160MB 1:1 Interleave	$2645	$2695	$2795	$2945	$2995	$3045	$3145
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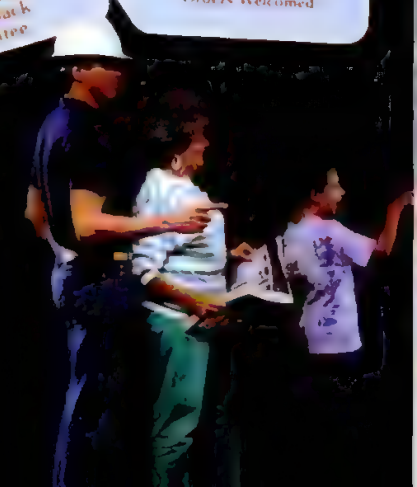

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40MB 1:1 Interleave	$1395	$1445	$1545	$1695	$1745	$1795	$1895
65MB 1:1 Interleave	$1495	$1545	$1645	$1795	$1845	$1895	$1995
80MB 1:1 Interleave	$1795	$1845	$1945	$2095	$2145	$2195	$2295
120MB 1:1 Interleave	$1895	$1945	$2045	$2195	$2245	$2295	$2395
160MB 1:1 Interleave	$2795	$2345	$2445	$2595	$2845	$2695	$2795
329MB 1:1 Interleave	$2895	$2945	$3045	$3195	$3245	$3295	$3395

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Landmark: 21/25.4 · Norton: 17.6/22.0

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- 2 Serial, 1 Parallel, & 1 Game Port
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30MB 1:1 Interleave	$ 995	$1045	$1145	$1295	$1345	$1395	$1495
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65MB 1:1 Interleave	$1145	$1195	$1295	$1445	$1495	$1545	$1645
80MB 1:1 Interleave	$1445	$1495	$1595	$1745	$1795	$1845	$1945
120MB 1:1 Interleave	$1545	$1595	$1695	$1845	$1895	$1945	$2045
160MB 1:1 Interleave	$1945	$1995	$2095	$2245	$2295	$2345	$2445
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Landmark: 16.1 · Norton: 13.4

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- MS DOS 3.3 or 4.01

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Video Options – Include Monitor & Video Card

MICROLAB XT-12 Price Matrix	Mono Chrome 12" 720x350	Mono Flat 14" 720x350	CGA Color 14" 640x200	EGA Color 14" 640x350	VGA Color 14" 640x480	VGA Multi 14" 800x600	VGA Hi Res 14" 1024x768
30MB 1:1 Hard Disk	$ 745	$ 795	$ 895	$1045	$1095	$1145	$1245
40MB 1:1 Hard Disk	$ 795	$ 845	$ 945	$1095	$1145	$1195	$1295
65MB 1:1 Hard Disk	$ 895	$ 945	$1045	$1195	$1245	$1295	$1395
80MB 1:1 Hard Disk	$1195	$1245	$1345	$1495	$1545	$1595	$1695
120MB 1:1 Hard Disk	$1295	$1345	$1445	$1595	$1645	$1695	$1795

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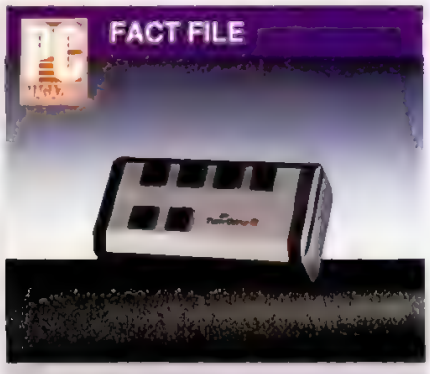


Turn-On 1003-PC
SL Waber Inc., 520 Fellowship Rd., Suite 306, Mount Laurel, NJ 08054; (800) 634-1485, (609) 866-8888.
List Price: $325.
In Short: Pricey for an autosense power strip, but worth it if what you really want is to switch on your PC through a modem.

CIRCLE **423** ON READER SERVICE CARD

Second, connect it to your modem and to your telephone wall jack, and the power to your computer and peripheral outlets goes on when the phone rings. The sensor outlet stays off, so the company recommends you use that for your monitor, which you don't need when you're remotely operating your PC. Power stays on as long as the phone is ringing or your modem is active.

To run a communications session, you can use *Dyna-Talk* (included in the package), or any popular remote-control software. *Dyna-Talk* includes a program that lets you keep the PC running to complete an operation after you hang up the phone. To take advantage of this ability, however, you'll also have to connect a serial cable from the PC to the remote control port on Turn-On's side.

Setting up for basic operation is easy, a matter of plugging in power and phone cords. Setting up the communication software takes a while and requires careful study of the clearly written manual.

The least attractive things about the Turn-On are its relatively short (6-foot) power cord, its light (10-amp) electrical load rating, and its UL 1449 rating of 400 volts peak. The 400-volt rating is still in the excellent range, but it's unattractive considering the product's price. And, at 10 amps, don't expect to be able to turn on your PC and laser printer at the same time. There's a good chance you'll blow the fuse.

The Turn-On won't satisfy you if you want individual control over each outlet, but it's a worthwhile way to work at the office without leaving home.

Tandy Corp.

Deluxe Power Center 26-1396

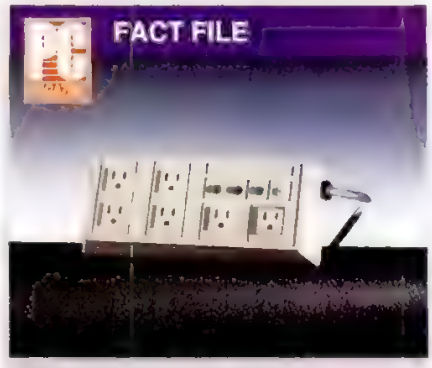
Plug your monitor into the sensor outlet on this oversize power strip, and your PC and peripherals come on every time you flick on the monitor. Priced at $70 and often available for less on sale, it won't satisfy anyone who wants individual control over outlets or modem/fax surge suppression. Otherwise, it's a bargain.

The sensor outlet is set to respond to any device that operates at 60 watts or more. That won't affect operation and is high enough to prevent a small current leak from accidentally turning on your system. If you need to adjust the sensitivity, a small screw on the bottom lets you do just that.

The six outlets are protected by surge and noise suppression circuitry that has the same lightweight appearance as Tandy's Power Switching System. Tandy's label gives it the same good 340-volt peak rating and 15-amp load limit. That's more than enough to handle an average system and protect it from anything short of a direct hit by a lightning bolt.

An indicator light on the power strip's top glows continuously to show that the surge suppressor is working. If it goes out, replace the power strip. An additional level of protection is provided by a low-power sensor that shuts everything off if the voltage from the wall drops below 70. When you first plug in the power strip, you'll need to push the low-power sensor's reset button to turn the outlets on.

Designed to protect your equipment in a brownout, that 70-volt threshold is on the low side for a hard disk. You're likely to experience problems, if not damage, well before the sensor shuts off power.



Deluxe Power Center 26-1396
Tandy Corp., One Tandy Center, Ft. Worth, TX 76102, (817) 390-3011.
List Price: $70.
In Short: A bargain if all you want is automatic power-on and good surge protection. The low-voltage sensor cuts in too late to protect your fixed disk fully in a brownout.

CIRCLE **424** ON READER SERVICE CARD

Tandy Corp.

Power Switching System 26-203A

List-priced at $100, Tandy's Power Switching System 26-203A gives you everything you want in a middle-of-the-road power director except modem/fax surge suppression. Catch it on sale—usually at around $70—and you may not be able to pass it up.

The six tiny push buttons protruding from the front of the bland metal case may initially be hard to hit. Five of them control outlets, and the separate master switch merely turns on power to the unit. There's nothing tentative about the switches; each clicks positively into on or off status. The sixth outlet is unswitched to provide uninterrupted power for your fax machine or whatever else you need to keep on continuously.

Indicator lights above the switches glow when they're on, and a separate light glows to show the surge suppressor is working.

The six outlets on the back of the product are widely spaced and installed so that their slots are vertical. You're likely to experience little trouble plugging in a modem transformer despite the Power Switching System's low (under 2-inch) height. The only other things in the back are the reset button for the 15-amp circuit breaker and an amply long 10-foot power cord and jack.

Inside the unit, the wiring is on the light side—16 gauge instead of the usual 14. This doesn't affect the 15-amp load rating. The single circuit board and wires are solidly mounted, and the soldered and other connections are clean. Posts riveted to the base help handle the weight when a monitor is placed on top of the case.

The case itself can act as a static eliminator since it's connected directly to the power cable ground. An extra feature is the strong swivel permanently attached to the bottom of the case.

FACT FILE
EDITORS' CHOICE

Power Switching System 26-203A
Tandy Corp., One Tandy Center, Ft. Worth, TX 76102; (817) 390-3011.
List Price: $100.
In Short: Six outlets, tiny push buttons, a long power cord but no modem/fax protection. Wait for a sale and buy it; you can't beat the deal.

CIRCLE 425 ON READER SERVICE CARD

The surge and noise suppression components mounted on the circuit board (instead of their own proprietary card) give the appearance of being on the light side. Regardless of the appearance, however, Tandy rates the 26-203A at a very respectable 340 volts peak.

Overall, you can't beat this deal, even if you spend an extra ten bucks for a separate modem/fax surge suppressor.

Tripp Lite Inc.
Command Console CCI 6 Plus

Priced on the low side at $139, Tripp Lite Inc.'s Command Console CCI 6 Plus provides all the functionality you need. It's the best choice if you need extra outlets and power-line/modem protection, but don't need a swivel base or LCD clock. A bonus is the generous 9-foot power cord.

The unit's utilitarian front has nothing more than five internally illuminated rocker switches and a green LED that indicates the surge suppressor is working. The switches have a positive feel, clicking firmly into place. Tripp Lite made a good design decision in separating the master switch from the others by a good four inches. You're unlikely to hit the wrong switch when you only want to turn off a peripheral.

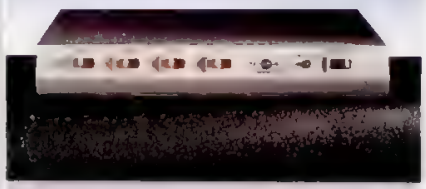
The CCI 6 Plus's master switch directly controls the computer outlet and turns on power for the entire unit.

Five of the outlets on the back are switched; the sixth provides continuous power for your fax machine, clock, or whatever else you need to keep on. The slots are horizontal, making it impossible to plug in a modem transformer without blocking another outlet, unless you want to plug it into the unswitched outlet. You're still likely to obstruct the modem/fax protection jacks, but that's not a problem after those wires are plugged in.

Labels on a single long piece of tape identify the outlets and jacks. The tape comes loose easily, which is annoying. It shouldn't happen with anything that costs this much.

Two circuit boards on the inside handle the protection duties—one for the phone line and a larger one for power protection. They're solidly mounted in the case, and all the connections are neat and secure. The surge and noise suppression components, however, appear to be on the light side. The peak voltage rating on the power director we reviewed was a mediocre 500 volts, but Tripp Lite's technical support later stated that all products now being sold have a UL rating of 330 volts peak. Be sure to check the product's label before purchasing.

FACT FILE



Command Console CCI 6 Plus
Tripp Lite Inc., 500 N. Orleans, Chicago, IL 60610; (312) 329-1777.
List Price: $139
In Short: A good deal, the Console CCI 6 Plus is the lowest-priced power director that has individually switched outlets and modem/fax surge protection.

CIRCLE 426 ON READER SERVICE CARD

Given that higher rating, the Command Console is the lowest-priced full-featured power director reviewed. ■

Walt Rowinsky is a free-lance writer based in Lakewood, Ohio.

She's 5 years old.
She's already had
7 names,
16 identities and
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CIRCLE 114 ON READER SERVICE CARD

by
Jay Munro

Lab Notes

Using HPPCL to Get The Most from Your LaserJet Printer

"A LaserJet in every office" might once have seemed as empty as a campaign promise, but if you include compatibles, it's a prospect that comes nearer to realization every day. Speed, multiple fonts, graphics capabilities, and high-quality output have made HP's LaserJet a natural choice for almost any printing project. So great is the popularity of this type of printer, that virtually every word processing package and software application that outputs to a printer now supports at least some of its features.

But where do you start when you want to make use of features not normally supported by your software or to add HP LJ support to your own programs? This installation of Lab Notes will help you understand the cryptic LaserJet language and, by means of some simple examples written in QuickBASIC, will show you how to incorporate it into your own programs. LZSELECT.EXE, in this issue's Utilities column, will simplify the task of sending the necessary commands to your LaserJet, even if you have no interest in programming.

Rudimentary printer languages have existed as long as there have been printers for computers to send output to. In the early days of microcomputing, printer commands were limited to *control characters*, borrowed from the teletype world. Standard low-value ASCII codes for commands like carriage return, line-feed, and form-feed were generated by simultaneously pressing the Ctrl key and an alphabet key. Ctrl-M, whose ASCII (decimal) value is 13, caused the printer to execute a carriage return, for example.

Only 32 such control codes were available, however, so *escape codes* were added to the language to support a growing number of printer commands. Implementing control with an escape character was easy: the printer would watch the incoming data stream, and when it found an ESC character (ASCII 27), it would appropriate the next character for itself, look it up in an internal table, and execute the designated command. All other characters in the data stream would pass through untouched and be printed.

■ When you need to go beyond the printer driver support built into your applications, QuickBASIC offers one handy way to tell your printer what to do.

As printers became still more sophisticated, escape codes went from simple two-character sequences (ESC plus one other character) to multicharacter escape sequences. By now, the escape sequences had not only to support the basic functions, but to accept additional parameters and data, as well.

ENTER THE HP LASERJET PRINTER

In 1984, Hewlett-Packard Co. introduced the machine that would change the future of printers forever. Admittedly, the original HP LaserJet looked and sounded more like an office copier than a printer. Inside, however, it boasted features far beyond those of any previous consumer printer. And to execute the LaserJet's set of more than 60 commands, HP introduced HPPCL, the HP LaserJet Printer Command Language. HP's PCL has been the standard for all HP LaserJet printers produced since. Indeed, like the Hayes modem command set, HPPCL has become a *de facto* standard that many other printer companies find it necessary to support.

The HPPCL standard began as an expandable language that could be used for both impact and nonimpact printers. It has since evolved into what is currently a five-level structure of printer commands. Each higher level builds on the features implemented in the previous level and provides almost total backward compatibility. (The only exceptions seem to be on undocumented features.) Level I, Print and Space, consisted mostly of the control codes, reset, simple character-set selection, and basic raster graphic support. Level II, Electronic Data and Transaction Processing, added cursor, margin, and line-spacing control. The original HP LaserJet supported what is now called Level III, or Office Word Processing. Level IV, Page Formatting, is supported by the HP LaserJet 500, Plus, Series II, and IIP. At the top of the scale, supported by the HP LaserJet III, is Level V, Office Publishing. This level not only supports more advanced PCL commands, but also incorporates HP-GL/2, the HP Graphics Language used on all HP plotters.

To cover the widest range of printer support, this article will focus primarily on Level IV, so unless otherwise noted, all the examples presented here will work with the HP LaserJet Series II, IIP, IID, III, and IIID printers. A couple of examples will give at least a taste of Level V (and so will only run on the HP LaserJet III or IIID printers), but these will be well labeled.

Two points should be noted here. First, while the PCL level designates the set of

available commands, not all models that use the same general PCL level have identical features and commands. For example, with the HP LaserJet Series II printer, you need separate fonts for portrait (vertical paper orientation) and landscape (horizontal paper orientation) printing. With the HP LaserJet IIP printer, on the other hand, a single downloaded font can be automatically rotated when the orientation is changed, so only one font file per size and typeface is needed for either orientation. Thus, knowing the basic PCL level does not eliminate the need to become familiar with the features of your specific model. Second, if you have not yet purchased an HP LaserJet and are trying to decide between the HP LaserJet IIP or III printer, my recommendation is to go for the model III if you can afford it. The advantages will be obvious later.

PCL COMMAND STRUCTURE

The HP *LaserJet Technical Reference Manual* for your particular printer is your best source for HPPCL information and HP LaserJet printer programming in general. These manuals are not provided with the printers, since many users never go further than what their application software provides. You can obtain them from HP, at a cost of $25 for the Series II and at no cost for the HP LaserJet IIP, III, or IIID, by mailing the card that comes with your printer.

Within the manuals, the escape sequences that constitute the commands of the HP Printer Command Language are listed in groups by function. The major headings may vary in exact wording for different models, but the following list (for the HP LaserJet IIP printer) is typical:

- Job Control Commands
- Page Control Commands
- Cursor Positioning
- Font Selection
- Font Management
- Soft Font Creation
- Graphics
- Macros
- Programming Hints

Each category is further divided into subheadings, and under each heading are the escape sequences that execute the commands. There may be hundreds of escape codes for a particular printer model, but they all share the same structure.

The HPPCL commands, usually referred to as *escape sequences*, can be divided into two types: *two character* sequences and *parameterized* sequences. The two-character escape sequences obviously have a very simple format: an escape character followed by an ASCII character in the range from 0 to ~. (This range corresponds to CHR$(48) through CHR$(126) in BASIC.) Two examples are the ESCE (Printer Reset) and ESC= (Half-Line-Feed) commands.

Most PCL commands are Parameterized escape sequences. The parameterized format uses a group of characters, divided

Not all models that use the same PCL level have identical features and commands.

(without intervening spaces) into five sections. For example, the sequence

```
Esc&a#L
```

where ESC is the escape character and a suitable number replaces the #, is used to set the left margin.

Figure 1 shows how the five main areas of a parameterized escape sequence are denominated in the HP documentation. The meanings are as follows:

Escape character—The first character in the command sequence is always the Escape character, which signals the printer that one or more commands are to follow. The representation of the escape character, however, can be confusing—even within HP's own documentation. In the HP documentation the escape character is shown as ^C, as in ^C&l10. However, on a LaserJet III font printout, the escape is shown as [esc]. We will be referring to the escape character here either as ESC, when talking about HPPCL escape sequences, or as ESC$, when showing BASIC program code. In any case, when ^C, ESC, or ESC$ is shown, it is representing the ASCII character 27, which is actually sent to the printer. In BASIC this character is represented by a CHR$ (27). When an escape character is printed to the screen, it shows up as a left arrow, (←).

Parameterized character—The Parameterized character is selected from the range of ASCII characters from ! to / (CHR$(33) to CHR$(47) in BASIC or !"#$%&'()*+,-./). Its purpose is to tell the printer that this escape sequence is a parameterized command; that is, that it has other characters associated with it. This character differentiates the code from a two-character escape sequence.

Group character—The Group character defines the group or type of command to be performed. In conjunction with the parameterized character, the group character specifies the type of function to be performed. The group character is taken from the ASCII character range from ' to ~(that is, CHR$(96) to CHR$(126)). Note that in current HP documentation, the lowercase letter *l* is printed in a script font to avoid confusion with the numeral *1* character. If a letter is used as the group character, it must always be lowercase.

Value field—The Value field specifies a numeric value used by the command.

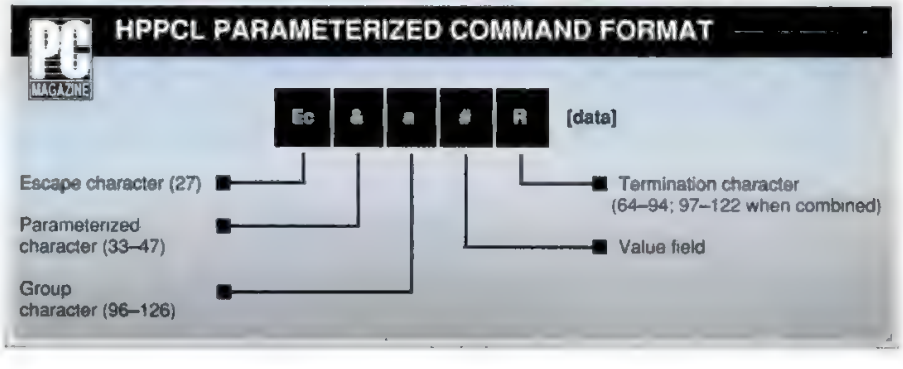

Figure 1: A *parameterized* command in HPPCL consists of these five main components, represented by the corresponding ASCII values. Values 48 to 63 cannot be used, since they are numbers and cannot be capitalized. Note that no spaces may be inserted between the various parts of the command.

This number may be selected from a standard set of choices or it may be a variable, such as a margin setting. Depending on the command, the value field may also accept a + or − and, in some cases, it may be a floating-point number. When a value is not supplied in an escape sequence that normally expects one, the value is assumed to be zero.

Termination character—The Termination character comes from the ASCII range of @ through ^, which is CHR$(64) to CHR$(94) in BASIC. The termination character both specifies the parameter to which the previous value field applies and signals the end of the escape sequence. Note that when escape sequences are combined (as explained later), the termination character is sometimes uppercase and sometimes lowercase.

[Data]—In addition to the five areas of the parameterized escape sequence, some commands require sending binary data to the printer. In such cases the value field indicates the number of bytes of data that will follow the termination character. The raster graphics command is one sequence that precedes a string of binary data.

USING ESCAPE SEQUENCES

Whether of the two-character or of the parameterized type, there are several ways to send the PCL-command escape sequences to the printer. With the exception of graphics and font files, the HP LaserJet printer accepts commands and data in the form of ASCII strings. Many of today's word processors allow user-entered printer escape sequences to be sent from within a document as "printer instructions." Alternatively, ASCII editors and word processors that can produce the ESC character can be used to create a file consisting of nothing but the command sequence. You could, for example, create a file called LM10, whose whole content would be

```
Esc&a10L
```

This file can then be sent to the printer with the DOS COPY command. Thus, to set the left margin on the LaserJet to column 10, you would simply enter

```
COPY LM10 LPT1:
```

This method of LaserJet control was discussed in a four-part Lab Notes series in our February 16, February 29, March 15, and March 29, 1988, issues.

In the examples that follow, we will use still another method, namely, sending the codes to the printer via QuickBASIC programs. QuickBASIC is an easy language to use in experimenting with escape sequences, since what you need is provided—string handling, variable conversion, input, output, and so on. GW-BASIC or BASICA could also be used, though some of the specific BASIC commands employed here would have to be modified, and line numbers would have to be added.

Other than the CHR$(27), the data we send here will be in a quoted string format. For the sake of clarity, and to reduce the number of characters on a line, the string variable ESC$ will be assigned to the escape character, CHR$(27), in all examples. When your own programs require numeric values, you can convert any numbers into strings using BASIC's STR$() function. Note that it is good programming practice to use LTRIM$() to trim the leading spaces that QuickBASIC's STR$ function leaves on positive numbers before using the value in an escape sequence.

A short QuickBASIC program for setting the left margin might begin

```
ESC$ = CHR$(27)
INPUT "Enter left margin value
";X% 'prompt for input

LM$ = LTRIM$(STR$(X%))
 'convert to a string

LPRINT ESC$;"&a";LM$;"L";
 'build escape sequence
```

In the above program you could eliminate the input and trimming functions and substitute an escape sequence the printer can understand directly. In such a case, to send a left margin of 10 columns, the second and final line of the program would simply need to be

```
LPRINT ESC$;"&a10L";
```

Notice that when printing combined strings, we use semicolons to add the next character. The same sequence could have been sent as

```
LPRINT ESC$+"&a10L";
```

FIGURE_2.BAS — **COMPLETE LISTING**

```
WIDTH LPRINT 255                          'disable QB's width checking
ESC$ = CHR$(27)
INPUT "Enter a Left Margin Value  (0 to 80) ";LM%
INPUT "Enter a Right Margin Value (0 to 80) ";RM%
LM$ = LTRIM$(STR$(LM%))                   'convert value to string
RM$ = LTRIM$(STR$(RM%))                   'convert value to string
Temp$ = ESC$+"&a"+LM$+"l"+RM$+"M" 'create escape sequence
LPRINT ESC$;"E";                          'reset printer
LPRINT Temp$;                                        'print new margins
FOR X = 1 TO 5
    LPRINT STRING$(160,65);               'print sample characters
NEXT X
LPRINT CHR$(12);                          'print formfeed
```

Figure 2: This short program illustrates how two escape sequences, for setting the left and the right margin, can be combined in HPPCL and safely concatenated in QuickBASIC and sent to the printer.

This method is not generally recommended, however, because QuickBASIC must make a temporary string of the codes and then use LPRINT to send it to the printer. This takes more time. Further, QuickBASIC occasionally has difficulty printing complex concatenated strings. If your program requires concatenating strings, create a temporary string first, and then LPRINT that. Figure 2 shows an example of this method and deserves some detailed examination.

When using the LPRINT command, QuickBASIC sets the width of printer output to a default of 80 characters. The statement WIDTH LPRINT 255 is used to disable the default, preventing possible breakup of a long escape sequence. The LPRINT statement also automatically inserts a CR-LF combination unless a semicolon is placed at the end of the line. When sending escape sequences, then, always be sure to add a semicolon to the end of the LPRINT statement. This way you can avoid unwanted line-feeds.

The two input statements in Figure 2 prompt for integer values of LM and RM, for left and right margin, respectively. The integer values are then converted to strings and the leading spaces trimmed. A tempo-

rary string, Temp$ is created by concatenating or adding the strings together with the escape character, ESC$, at the beginning. Temp$ is then printed with the LPRINT command, along with a string of sample characters and a form-feed.

Turning from considerations about using QuickBASIC to those that concern HPPCL, you should notice that the Temp$ in Figure 2 contains *two* PCL commands—one for the left and the other for the right margin setting. There is only one ESC$ and only one pair of parameterized and group characters, however. This is because PCL allows *certain* escape sequences to be combined, thus saving printer memory and reducing the transfer time required.

The PCL rules for combining escape sequences are simple: When the first two characters following the escape character are the same, the codes can be combined by dropping the escape, parameterized, and group characters from all but the first code in the sequence; and second, the termination character of all but the *last* code must be lowercase—the last termination character must be uppercase. In QB, the *separate* strings for setting a left margin of 5 and a right margin of 75 would be

```
ESC$+"&a5L"
```

and

```
ESC$+"&a75M"
```

When combined, however, they become

```
ESC$+"&a5175M"
```

(Outside of BASIC, in PCL terms, the combined sequence is ESC&a5175M.)

A common mistake when combining escape sequences is trying to combine unlike codes. The left margin command ESC$;"&a5L"; could not be combined with the top margin code ESC$;"&l6E"; because the first two characters—&a and &l—are not the same case. Again, a problem is created by not using correct case for group and termination characters, as in

```
ESC$;"&A5L75M"
```

You'll also encounter difficulties if you include the parameterized and group character more than once in a combined sequence, as in

```
ESC$;"&a5L&a75M"
```

To fix this sequence, you could add an ESC$; after the L and before the &. But it is more economical to make the L lowercase and drop the second set of &a characters.

The usual symptom of these problems is that the LaserJet ignores the commands and simply prints the escape codes instead of interpreting them.

If you find that the printed output does not match what you expected or the escape sequences were ignored, send a Reset command, as shown in the next program, to the printer, before attempting to resend.

INITIALIZING THE HP LASERJET

The miniprogram shown in Figure 3 initializes the printer for a common task, namely, to print a series of reports. The program starts by sending a Reset command:

```
ESC$;"E";
```

The Reset escape sequence prints anything that is in the printer buffer, clears out any temporary soft fonts and temporary macros in the printer's memory, and restores the printer to the *user's* default environment. The Reset command does not return to the factory defaults, but to the known conditions the user has set from the front panel. Since an escape sequence always takes precedence over a front-panel setting, Hewlett-Packard recommends that the Reset command be sent at the beginning of every job.

To save space in the program of Figure 3, the escape sequences have been combined, following the rules just outlined. The left and right margins have been combined as before, and the top margin setting has been combined with a command to disable perforation skipping.

Skipping perforations is not something one would ordinarily associate with sheet-fed printers. Nonetheless, mismanaging the area between the bottom of the text area on one page and the top of the printable area on the next page can produce undesired effects. The default setting is Perforation Skip Enabled. This causes the printer to eject a page when the printing goes beyond the number of lines set for the page length. While this is normally what you want the printer to do, it can be annoying when you print documents that have embedded page feeds and that are formatted to contain exactly the number of lines to which the page length is set. The result in such a case is that an extra page is ejected for each one printed.

By sending the sequence

```
ESC$;"&l0L";
```

the program in Figure 3 overrides the HP default setting. Be aware, however, that with Perforation Skip Disabled, any text printed past the actual printable area will be lost or truncated, so this setting is desirable only in the case just mentioned. To restore the HP default, just change the 0 in the sequence back to 1; that is, send the command sequence

```
ESC$;"&l1L";
```

A note should be added here about the left and right margin settings, as well. Horizontal Margin settings are relative to the Horizontal Motion Index, or HMI. The HMI can be set directly with the QB escape sequence

```
ESC$;"&k#H";
```

(ESC&k#H in PCL), where # is the number of 1/120-inch increments to be used for each column unit. This value can range from 0 to 840 on the Series II, and up to 32,767 for the HP LaserJet IIP, III, and IIID; it is valid to four decimal places.

When a fixed-pitch font is being used, the default HMI value is set by that font.

INITIAL.BAS — COMPLETE LISTING

```
WIDTH LPRINT 255
ESC$ = CHR$(27)
LPRINT ESC$;"E";           'Reset to defaults
LPRINT ESC$;"&l6e0L";      'Top margin = 6, disable perf skip
LPRINT ESC$;"&a5175M";     'Left margin = 5, Right = 75
```

Figure 3: This short program initializes the LaserJet to values suitable for printing reports.

With the normal 10-pitch courier font, a left margin of 5 would be 5 characters, which, at 10 characters per inch, results in a half inch margin. If you change the font to 16.66 pitch—the condensed, or line-printer, font—the margin of 5 characters becomes a little over a third of an inch. Note that the right margin is measured from the left edge of the paper, so to create a 1-inch right margin, you would use a value of 75.

As explained later on, the margins are based on an area known as the Logical Page. So to get a half-inch margin on a LaserJet III, the adjusted margin setting would be approximately 2, not 5 (the Logical Page starts .25 inch from the edge). The Logical Page edge varies in width between HP printer models, so the most accurate setting is achieved by trial and error.

ROTATE.BAS — **COMPLETE LISTING**

```
DEFINT A-Z                  'integers only please
WIDTH LPRINT 255            'disable BASIC's line wrap
ESC$ = CHR$(27)             'assign ESC$
LPRINT ESC$; "E";           'reset printer
LPRINT ESC$; "&a27r45C"; 'position cursor row 27, col 45
FOR X = 270 TO 0 STEP -90 'set-up a for next loop with
   LPRINT ESC$; "&f0S";  'push (save) cursor position
   Temp$ = "&a" + LTRIM$(STR$(X)) + "P" 'build the escape sequence
   LPRINT ESC$; Temp$;    'print escape sequence
   LPRINT STR$(X); " degrees"; 'print some text
   LPRINT ESC$; "&f1S";  'pop (retrieve) cursor position
NEXT X
LPRINT CHR$(12);            'form feed
```

Figure 4: With the LaserJet III and subsequent models, print direction can be rotated in 90-degree increments, without changing page orientation.

ORIENTATION AND PRINT DIRECTION

The default print orientation is Portrait mode, which prints on standard-size paper with the text across the short way. It's called *portrait* mode because a painting of a person usually has a vertical orientation. Conversely, *landscape* mode prints the long way across the paper. It also takes its name from the art world, since landscapes are normally painted horizontally.

Print orientation can be changed either at the front panel or with an escape sequence, but it can be set only once per page. Changing the orientation in midpage causes the printer to eject the current page before honoring the new orientation. The QB escape sequence

```
ESC$;"&l0O";
```

sets portrait mode. Changing the 0 to a 1, that is

```
ESC$;"&l1O";
```

specifies landscape mode. (Again, outside its BASIC representation, the respective PCL escape sequences for portrait and landscape orientations are ESC&l0O and ESC&l1O, respectively.)

The ability to change the printing direction is a feature recently introduced with the HP LaserJet III printer. While setting the paper orientation is still a once-per-page command, the print direction may be changed as often as needed. If you have a LaserJet III or later, the program shown in Figure 4 will demonstrate the print direction command

```
ESC$+"&a#P"
```

where the # is replaced by the degree of rotation, in 90-degree increments.

As the text is rotated, the cursor position stays in the center because of the PUSH and POP cursor-position commands. The Push Cursor ESC$;"f0S"; and the Pop Cursor ESC$;"f1S"; commands

The ability to change the printing direction is a feature recently introduced with the HP LaserJet III printer.

are used in pairs to preserve the current cursor position and can be nested up to 20 deep. Try removing them and see what happens: the cursor position is left at the end of each word and, instead of making a four-point star, a box is created.

CURSOR POSITIONING

The program in Figure 4 positions the cursor by row and column, which is similar to printing to a text screen on the PC. The Row measurement is based on current Vertical Motion Index (VMI), which can be set with the escape sequence

```
ESC$;"&l#C";
```

where # is the number of 1/48-inch increments between printed rows. As with the HMI, this can be varied, ranging from 0 to 336 for the Series II, or to 32,767 for the LaserJet IIP, III, and IIID. The VMI can also be set by the lines-per-inch command

```
ESC$;"&l#D";
```

If the lines per inch is at the default of 6 lines per inch, then row 24 is almost 4 inches down from the top. However, if the lines per inch is set to 12, when the cursor is located at row 24 it's only about 2 inches down from the top. Similarly, the column measurement is based on the Horizontal Motion Index (HMI), which is usually the width between fixed-pitch characters. When using proportional fonts, the relationship between columns and the character width will no longer be valid, because of the variable amount of space used by the characters.

In addition to positioning in terms of rows and columns, then, you can also position the cursor by units measured in *dots* or *decipoints*. The *dot* is the smallest printable unit—1/300-inch—on the HP LaserJet. The printer's 300-dot-per-inch (DPI) resolution is the same in both vertical and horizontal directions. While the resolution of the HP LaserJet has been 300 dpi since the first model, the ability to locate the cursor in terms of dots did not become available until the Series II.

Decipoints are the smallest increment of cursor movement. There are 72 points per inch and 10 decipoints per point, so a decipoint is 1/720 of an inch. The LaserJet also supports the decipoint unit for compatibility with high-resolution typesetting devices. For internal calculations, the HP LaserJet Series II uses 1/3600 inch, and the IID, IIP, III, and IIID use 1/7200 inch. How-

ever the decipoint (1/720 inch) is the smallest accessible unit of movement.

The QB program shown in Figure 5 locates and prints a message using cursor positioning specified in dots. When text is located directly with the various cursor-positioning commands, left and right margin settings and text length settings are overridden. This feature can be useful when you need to position footnotes or page numbers and don't wish to reformat the body of text.

In Figure 5 the cursor is first located at row 10. The letter F is then printed repeatedly on the same line, starting at 300 dots, and locating it 20 dots to the right on each pass through the loop. Since the normal spacing between the letters would be 30 dots at 10 pitch (10 cpi x 30 dots = 300 dpi), this produces a partial overlapping of the printed Fs.

The positioning commands discussed so far have located the cursor at an absolute place on the page. The reference location (0,0) for absolute positioning is the intersection, or corner, where the top margin meets the left edge of the logical page. The cursor can also be moved relative to its current position, however. Using relative movement provides an easy way to move in specific increments without having to calculate every point.

To locate the cursor relative to the last position, you add a plus sign to the value for positive movement; likewise, a minus sign for negative movement. To move the cursor 10 dots to the right of the current position, the QB escape sequence would be

```
ESC$;"*p+10X";
```

To move 10 dots to the left, you would simply change the + to a − sign in the sequence shown. Figure 6 lists a short QB program that prints at incremented values for both the Row and Column.

RELCURSR.BAS — **COMPLETE LISTING**

```
DEFINT A-Z
WIDTH LPRINT 255
ESC$ = CHR$(27)
LPRINT ESC$; "E";
FOR X = 0 TO 9              'do 10 Heys!"
  LPRINT ESC$; "&a+"; LTRIM$(STR$(X)); "R"; 'vertical position
  LPRINT ESC$; "&a+"; LTRIM$(STR$(X)); "C"; 'horizontal position
  LPRINT "Hey";             'print a message
NEXT
LPRINT CHR$(12);            'print page
```

Figure 6: By putting a plus sign (+) or a minus sign (−) in the value field, the printing position or cursor can be shifted relative to its present location in terms of both rows and columns.

PRINTABLE AREAS

Any explanation of absolute and relative cursor locations would be incomplete without a discussion of printable areas. The HP LaserJet page contains three areas: the *Physical Page*, the *Logical Page*, and the *Printable Area*. These are shown diagramatically in Figure 7.

The *Physical Page* is the actual paper size—usually the standard letter size paper of 8.5 by 11 inches, though legal, European, and executive sizes are also supported. In no case, however, is it possible to print to every point on the Physical Page with the HP LaserJet.

The *Logical Page* is the area within the Physical Page where the cursor can be located or addressed. The cursor may be positioned anywhere within the Logical Page boundaries, but cannot move outside them. The Logical Page on a LaserJet III is approximately 75 dots (.25 inches) in from the Physical Page edge on the left and right sides. The Logical Page extends to the top-to-bottom edges of the Physical Page in either portrait or landscape orientation.

Margins are measured in relation to the Logical Page not the Physical Page. To set an accurate physical margin, the desired margin must account for the 75-dot difference between the paper's edge and the Logical Page. To set an actual 1-inch left margin, you must set the margin to .75 inch. (1.00 inch − .25 inch = .75 inch). Even though the whole length of the Logical Page can be addressed, you cannot print on all of this area. The top margin default is 3 lines at 6 lines per inch, or .5-inch from the top of the paper, for example.

The *Printable Area* designates the maximum printable boundaries. Characters that extend outside the Printable Area of the Series II are clipped at the character level (that is, the whole character is lost); where as characters that extend outside the boundaries of the LaserJet IIP, IID, III, and IIID are clipped at the dot level; this means that only a portion of the character is missing. In these latter models, the printable area is normally slightly wider than the Logical Page. This allows the LaserJet IIP and III to use the Left and Top Offset Registration—ESC$;"&l#U"; for the left, and ESC$;"&l#Z"; for the top. The #s are replaced by the number of decipoints by which to offset and are either positive or negative values, to allow a shift in any direction.

The offset registration adjusts the text position of the Logical Page to provide room for a binding, such as three-ring punching or spiral. Note, however, that if the Offset is adjusted too far and so goes outside the Printable Area, characters or data will be lost.

POSITION.BAS — **COMPLETE LISTING**

```
DEFINT A-Z
WIDTH LPRINT 255
ESC$ = CHR$(27)
LPRINT ESC$; "E";           'reset printer
LPRINT ESC$; "&a10R";       'locate cursor at row 10
FOR X = 300 TO 2000 STEP 20   'locate at 300 dots + X
    Temp$ = ESC$ + "*p" + LTRIM$(STR$(X)) + "X"
    LPRINT Temp$; "F";      'print esc code + "F"
NEXT X
LPRINT "ast!";          'print rest of the word
LPRINT CHR$(12);        'print page feed
```

Figure 5: The cursor (print) position on the Series II, IIP, and III printers can be set in increments of 1/300 of an inch, the width of a single dot.

LINES AND FILLS

Drawing lines with the HP LaserJet requires a slight adjustment in the way you think of a line. BASIC programmers normally regard a line as a fixed-width entity. When using an HP LaserJet to draw a horizontal or vertical line, you must instead think in terms of a filled rectangle, adjust-

ing its horizontal and vertical width to create it. The program shown in Figure 8 illustrates the procedure.

The printed result of running this program is a 4- by 4-inch cross, each line of which is 10 dots wide. The cross consists

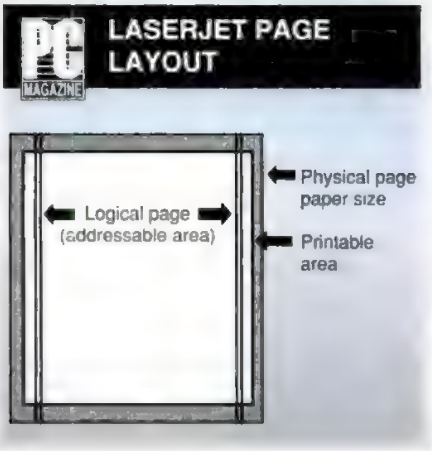

Figure 7: The LaserJet cannot print to the physical edges of an 8.5- by 11-inch sheet. In Series II printers, the width of the "logical" (cursor addressable) and the "printable" areas is the same and totals approximately half an inch less than the paper width (fixed at 50 dots from the left side and 100 dots from the right side). For Series IIP and later models (as shown here) the logical width is centered at 75 dots from each side but can be shifted to either edge of the printable area by using offset commands. In all cases, the logical page length is longer than the printable page length by less than half an inch.

of two rectangles; one is 1,200 dots wide by 10 dots tall, and the other is 10 dots wide by 1,200 dots tall. For the first rectangle, the ESC$;"*c0P"; sequence selects a solid black fill pattern for the rectangles. For the second, the solid fill escape sequence is combined with the size commands.

Solid black is not the only fill pattern the HP LaserJet can produce. There are seven shades of gray, plus black, and six fill patterns that can also be used. To see a sample of each, simply run the program listed in Figure 9.

The first row of boxes shows the gray scale, whose percentage (from 1 percent to 100 percent) is divided into eight ranges. The second row are the six HP defined patterns (1 to 6). The six patterns are; horizontal, vertical, ascending diagonal, descend-

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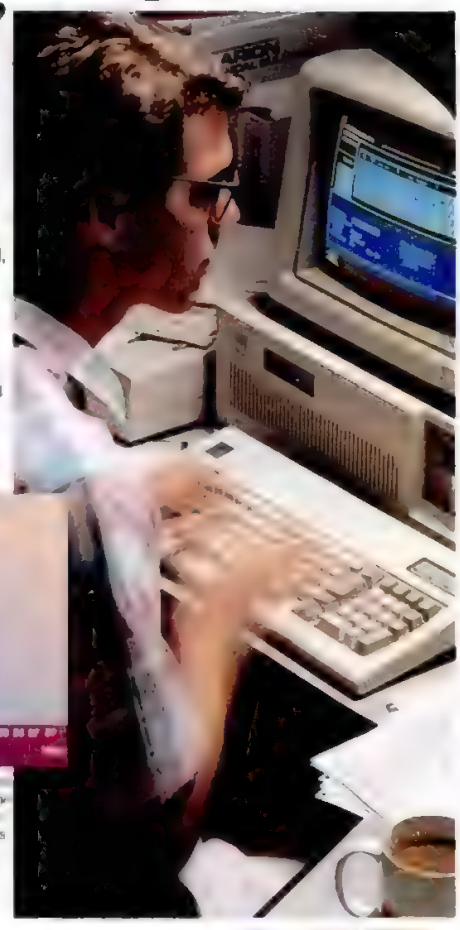

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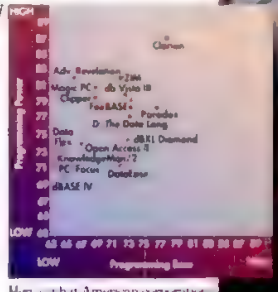

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CROSS.BAS COMPLETE LISTING

```
DEFINT A-Z
WIDTH LPRINT 255          'disable BASIC linefeeds
ESC$ = CHR$(27)           'assign ESC char
LPRINT ESC$; "E";         'reset printer
LPRINT ESC$; "*p1200y600X";     'locate 4" down, 2" over
LPRINT ESC$; "*c1200a10b";      '1200 x 10,
LPRINT ESC$; "*c0P";            'black fill
LPRINT ESC$; "*p600y1200X";     'locate 2" down, 4" over
LPRINT ESC$; "*c10a1200b0P";    '10 x 1200, black fill
LPRINT CHR$(12);          'form feed
```

Figure 8: Lines are drawn in PCL by filling rectangles appropriately. This short program creates a cross, made up of two such rectangles.

ing diagonal, horizontal and vertical cross hatch, and diagonal cross hatch lines. The escape sequence for Area Fill is

```
ESC$;"*c#G";
```

where # is replaced by either a percentage for a fill (gray scale), or a number from 1 to 6 for a pattern. The additional sequence

```
ESC$;"*c#P";
```

then specifies what type of fill to use. The available options are:
0—solid black fill
1—solid white fill
2—shaded (percent on last code)
3—HP defined pattern (1 to 6)
5—current pattern
Fills 0, 2, and 3 are available for all printers; 1 is available on the IIP, III, and IIID and 5 is only available with the III and IIID.

The solid white fill, which is restricted to the IIP and later printers, is used to erase areas. To create a frame with a wide border, you can define a black or shaded box with a white box inside it. The demonstration program listed in Figure 10 will work on a IIP or III printer.

The rectangle fill commands can create only horizontal or vertical lines. To create a diagonal line, a circle, or an arc, the requisite points would have to be calculated and connected with small boxes or lines. Another method would be to create a bit image of the line in memory and send it to the printer in a raster graphics format. However, in PCL Level V, the HP LaserJet III supports the HPGL/2 extension to the PCL command set that contains many predefined graphics commands. HPGL is the Hewlett-Packard Graphics Language, a widely supported plotter language.

HPGL/2 support in the HP LaserJet Series III is a topic for another time, but the program shown in Figure 11 will give you a sample of the power of HPGL/2.

PATTERNS.BAS COMPLETE LISTING

```
DEFINT A-Z
WIDTH LPRINT 255          'disable BASIC linefeeds
ESC$ = CHR$(27)                    'assign ESC char
LPRINT ESC$; "E";         'reset printer
DATA "1","5","15","25","45","65","85","100"  'fill patterns
LPRINT ESC$; "*p300Y";    'locate down 1 inch
FOR X = 1 TO 8
    READ SF$              'read shaded fill
    LPRINT ESC$; "*c300a300b"; SF$; "g2P"; 'print 1" box
    LPRINT ESC$; "*p+300X"; 'move over 1" relative to last position
NEXT X
LPRINT ESC$; "*p+600y270X"; 'move down
FOR X = 1 TO 6
    LPRINT ESC$; "*c300a300b"; LTRIM$(STR$(X)); "g3P";
    LPRINT ESC$; "*p+310X"; 'move cursor
NEXT X
LPRINT CHR$(12);          'form feed
```

Figure 9: LaserJet series printers can produce seven gray shades in addition to black and six fill patterns. Run this program to see an example of each.

SOFT FONTS

LaserJet users who want their documents to have just the right *look* have an enormous variety of downloadable *soft fonts* from which to choose. In addition to purchasing from commercial soft font vendors (HP, Bitstream, Agfa-Compugraphic, and many others), you can even download shareware font samples from the libraries of the HP forum on CompuServe.

Many of today's advanced word processors automate the process of downloading, selecting, and printing with soft fonts, and a number of commercial and shareware font management utilities are available to simplify these tasks for nonautomated applications. We'll concentrate here on how a QuickBASIC program can make use of them.

The most widely used soft fonts are *bitmapped fonts*—basically a collection of bit patterns that represent the characters. The bit patterns are organized by internal escape commands that define the character, size, and other attributes of the character set. The font is stored in the printer's memory by downloading or transferring the data from a file. Each soft font is identified within the printer's memory by assigning it a unique ID number, from 0 to 32,767, at download time.

Scalable fonts use hinting to ensure the highest-quality font appearance no matter what size is used.

In the program shown in Figure 12, a soft font is downloaded with an ID of 54, an arbitrary number. For the font filename (FontFile$) you can substitute the name of any HP-compatible soft font you have. The first sequence—ESC$;"*c54D";—sets the ID number to 54. The font file is then OPENed for BINARY as #1, and the printer is OPENed for BINARY as #2. Binary file access is used because the font files contain data with the full range of ASCII values, from 0 to 255. Binary rather than standard character output to the printer is necessary: otherwise DOS would stop downloading if it hit a bit pattern corre-

ERASE.BAS — **COMPLETE LISTING**

```
DEFINT A-Z
WIDTH LPRINT 255
ESC$ = CHR$(27)
LPRINT ESC$; "E";
LPRINT ESC$; "*p900y600X";       'locate 3" down, 2" in
LPRINT ESC$; "*c900a900b70g2P"; '70% gray box
LPRINT ESC$; "*p+75y+75X";       'locate .25" over and down
LPRINT ESC$; "*c750a750b1P";     'white box
LPRINT CHR$(12);
```

Figure 10: The LaserJet IIP and later printers can "erase" an area by filling it with a white box.

sponding to CHR$(26), the End Of File marker.

The program reads a block of data from the font file into the BUFFER$ with the GET command, and then PUTs the buffer into the printer, repeating until finished. Upon completion of the file transfer, the escape sequence—ESC$;"c5F";—is sent to designate the font as permanent. To make the font temporary, you would substitute a 4 for the 5 in this code. A printer Reset command will delete a temporary font but not a permanent one. The newly downloaded font is specified as the primary, or current, font by sending the ESC$;"(54X"; sequence.

To change between several soft fonts that have been downloaded, substitute the other ID numbers for the 54 in this example. If you download a font using the ID of a font already in printer memory, the new font will replace the old one.

Starting with the LaserJet III, Hewlett-Packard integrated Agfa-Compugraphic's Intellifont font-scaling technology. The LaserJet III contains two resident *scalable* font typefaces, the sans serif Univers, and the serifed CG Times. Additional scalable fonts are available, both in cartridges and in downloadable form.

Scalable fonts have a number of important advantages over the standard bitmapped fonts. First, scalable fonts can be sized in .25-point increments from .25 to 999.75 points, without using any additional memory. The maximum size of a bitmapped downloadable font is 200 points (a height of about 3 inches)—memory permitting; the amount of memory your printer has determines the largest size of font that can be downloaded. Second, separate bitmapped fonts must be downloaded for each size and typeface, and this can quickly require a large investment in printer memory.

Moreover, since the scalable fonts also take advantage of the LaserJet III's resolution-enhancement technology, they appear sharper than most outline-generated fonts. When it uses resolution enhancement, the printer actually varies the size of dots to fill in curved and diagonal lines, where the "jaggies" usually appear. The scalable fonts also use a software technique called *hinting*, which ensures the highest-quality font appearance no matter what size is specified. The commands to access hinting are not publicly available, but developers may contact Agfa-Compugraphic to license the technology.

When the Series III does a test printout, the escape sequences needed to access the fonts are printed below the print sample on the right side of the page. Here is an example of how the Univers Bold font sequence appears:

```
<Esc>(10U<Esc>(s1p__v0s3b4148T
```

If each command that makes up the sequence were sent individually, it would break down like this:

```
Esc(10U    -- Select PC 10 character
                set
Esc(s1P    -- Designate proportional
                spacing
Esc(s#V    -- Height in points (#)
Esc(s0S    -- Upright style
Esc(s3B    -- Bold stroke weight
Esc(4148T -- Univers font type face
```

The underscore would be filled in with

PLOTTER.BAS — **COMPLETE LISTING**

```
'Example of HPGL/2 special effects
WIDTH LPRINT 255: ESC$ = CHR$(27)
LPRINT ESC$; "%1B";                'enter HP-GL/2 mode
LPRINT "IN;SP1;";                  'initialize
LPRINT "PA2000,4700;";             'select pen 1
LPRINT "PD;PR 0,2550,4200,0,0,-2550,-4200,0;"; 'make a box
LPRINT "PU;";                      'lift pen for move
'define a user fill pattern--index 1, 32 dots wide * 24 dots high
LPRINT "RF1,32,24,";
LPRINT "0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,";
LPRINT "0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,";
LPRINT "0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,";
LPRINT "0,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,0,0,1,1,1,1,1,1,1,1,1,0,0,0,0,0,0,0,";
LPRINT "0,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,1,1,1,1,1,1,1,1,1,1,1,0,0,0,0,0,0,0,";
LPRINT "0,1,1,1,0,1,0,0,1,1,1,1,1,0,0,0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,0,0,0,";
LPRINT "0,1,1,1,1,0,0,0,0,1,1,1,1,0,0,0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,0,0,0,";
LPRINT "0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,0,0,0,";
LPRINT "0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,0,0,0,";
LPRINT "0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,0,0,0,";
LPRINT "0,1,1,1,1,1,1,1,1,1,1,1,1,0,0,0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,0,0,0,";
LPRINT "0,1,1,1,1,1,1,1,1,1,1,1,1,0,0,0,1,1,1,1,0,0,0,0,0,1,1,1,0,0,0,0,0,0,";
LPRINT "0,1,1,1,0,0,0,0,0,0,0,0,0
```

Lab Notes

DOWNLOAD.BAS — **COMPLETE LISTING**

```
DEFINT A-Z                    'font copy routine
ESC$ = CHR$(27)                       'assign Esc character
BufLen = 4096                         'set a buffer size
Buffer$ = SPACE$(BufLen)              'buffer for transfer
FontFile$ = "BW140BPX.USP"            'font file name
OPEN FontFile$ FOR BINARY AS #1 'open the font file
FILELEN& = LOF(1)                     'find out it's length
OPEN "LPT1" FOR BINARY AS #2          'open printer
FontID$ = ESC$ + "*c54D"              'set font id number
PUT 2, , FontID$                      'send it to the printer
DO                                    'download the font
  IF FILELEN& < BufLen THEN         'for the last block
    Buffer$ = SPACE$(FILELEN&)      '  it's almost always
  END IF                            '  shorter than BufLen
  GET 1, , Buffer$                  'get a block
  PUT 2, , Buffer$                  'put it to the printer
  FILELEN& = FILELEN& - LEN(Buffer$) 'track size
LOOP WHILE FILELEN&                 'keep going until out of data
Perm$ = ESC$ + "*c5F"               'make it permanent
PUT 2, , Perm$                      '
SetID$ = ESC$ + "(54X"              'make it primary
PUT 2, , SetID$
CLOSE                                 'close the files
FOR X = 1 TO 10                       'test it...
LPRINT "This is a test "
NEXT X
LPRINT CHR$(12);                      'form feed
```

Figure 12: This program will download any HP-compatible soft font whose filename you supply as FontFile$ (line 4), give permanent status, and assign the (arbitrary) ID number 54.

the point size you want to use. To send the sequence in QuickBASIC for a 14-point font, you simply use the command

```
LPRINT ESC$;"(10U";ESC$;"
(s1p14v0s3b4148T";
```

MACROS

Macros serve the same function in HP PCL that they do in software applications: they speed and simplify operations by eliminating the need to rekey long, frequently needed sequences. As a conclusion to this Lab Notes, we will draw from our previous examples to create a macro program that sets up and prints a letterhead on every page.

The HP LaserJet supports a powerful set of macro commands. A macro consists of a set of commands recorded in printer memory and identified in all subsequent operations by a macro ID number. Using QuickBASIC, the Macro ID is specified by the sequence

```
ESC$;"&f#Y";
```

where the # is replaced with any number from 0 to 32,767. (Outside a BASIC program, the assignment escape sequence is simply Esc&f#Y). Memory permitting, up to 32 macros can be defined for Series II LaserJets, and up to 32,767 can be defined with the IIP, IID, III, and IIID.

Once the Macro ID number has been specified, a series of macro control commands is used to define, enable, and delete the macro. The Start Macro sequence

```
ESC$;"&f0X";
```

tells the printer to record all commands that follow and associate them with the macro ID number last specified. With only a few exceptions—printer reset, display functions, and macro commands other than call or execute—almost any command can be included. (Note, however, that in the Series II and earlier, no font management commands, such as download, delete, or make font permanent, are allowed.) One macro can call or execute another macro, though only two levels of nesting are permitted.

Sending the End Macro sequence

```
ESC$;"&f1X";
```

signals the end of the macro, which is now defined and ready to be used. The macro can be made permanent (until the printer is turned off) by issuing the command

```
ESC$;"&f10X";
```

This protects the macro against being accidentally deleted by a Reset command.

HP LaserJet macros can be used in three different ways—Execute, Call, and Automatic OverLay—each of which produces a different effect on the current printer environment settings. Since all macro commands operate on the last macro ID specified, you must remember to send the

```
ESC$;"&f#Y";
```

sequence with the appropriate # before using any of the following commands.

The operation of Execute Macro is the easiest to understand. When a QB program sends the

```
ESC$;"&f2X";
```

sequence, the commands associated with the current macro ID number are executed, and any changes the macro makes to the printer environment remain in force after the macro concludes. Thus, for example, you would use the Execute Macro command to change a font and margins for a block of text that would follow. Another macro could then be executed to return the original settings.

HP LaserJet macros can be used in three ways—Execute, Call, and Automatic OverLay—each of which produces a different effect on the printer settings.

Like the Execute Macro command, the Call Macro sequence

```
ESC$;"&f3X";
```

can change the environment (margins, font, and so on), but in this case the changes are discarded and the previous environment is restored when the macro is completed. The only exception is the cursor position, which is not automatically

saved and restored by Macro Call. However, by issuing the Push Cursor command

```
ESC$;"&f0S";
```

at the start of the macro and the Pop Cursor command

```
ESC$;"&f1S";
```

at the end of the macro, the cursor position is maintained. The Push and Pop commands can be placed outside the macro call, but it will save time and memory if you include them in the macro itself. A called macro is usually a self-contained set of commands, such as those for printing a logo.

The Enable Automatic Overlay command

```
ESC$;"&f4X";
```

is similar to the Call Macro command, except that it automatically executes the macro on each page. In the operational sequence, the page is first printed, but before the page is ejected, the Overlaid macro is executed. Automatic Overlay Macros follow the same rules as the Called macro, and are useful for printing headers and footers. To discontinue the operation of an Automatic Overlay macro, the

```
ESC$;"&f5X";
```

command sequence is used.

The program listed in Figure 13 demonstrates the use of macro (and other) commands to create a letterhead for a fictional company. Printing letterheads is one of the most popular uses for macros, and a number of variations have been published in various of the HP *LaserJet Technical Reference* manuals. The cursor movement commands in the program in Figure 13 assume a 14-point font, but you can adjust them as needed. The program also assumes that the font to be used has already been downloaded to the printer (as with the program shown in Figure 12).

LETTERHD.BAS — **COMPLETE LISTING**

```
DEFINT A-Z
WIDTH LPRINT 255
ESC$ = CHR$(27)
LPRINT ESC$; "E";
LPRINT ESC$; "&f1y0x0S";      'Macro #1, start macro, push cursor
LPRINT ESC$; "&l0e0L";        'top margin = 0, perf skip off
LPRINT ESC$; "*p75x150Y";     'locate cursor .5" down and in from
                              '  left
LPRINT ESC$; "(54X";          'select font 54 (previously
                              '  downloaded)
LPRINT "VaporWare INC.";      'company name to appear over line
LPRINT ESC$; "*p75x+10Y";     'locate cursor .5" in from left
LPRINT ESC$; "*c2200a30b30g2P"; 'make a line 1/10" tall, 7" long,
                                '  30% shaded
LPRINT ESC$; "*p+75Y";         'move cursor down 1/4"
LPRINT "One Park Avenue, New York, NY  10001" 'address
LPRINT ESC$; "&f1s1X";        'pop cursor and end macro
LPRINT ESC$; "&f4X";          'set as automatic overlay

FOR X = 1 TO 3                'print three pages to show it works
    LPRINT ESC$; "&a30c30R";        'locate cursor center page
    LPRINT "This is page";STR$(X)   'print a message
    LPRINT CHR$(12);                'form feed
NEXT X
```

Figure 13: Automatically printing a letterhead on each sheet is one of the most popular uses for PCL macros. This program generates a letterhead (in 14-point type) for a fictional company.

DEBUGGING

Since to err is human, debugging is an important part of working with any language. A simple typo that goes unnoticed can bring down a whole program. Debugging HP LaserJet escape codes can be tedious, especially when they are incorporated into a large program. As mentioned earlier, the HP LaserJet examines incoming data, and if it finds an escape character, it interprets the following character sequence for further instructions. But what happens if the escape sequence is wrong or outside the range allowed for that command?

An invalid escape sequence gets printed instead of executed, which makes tracking down the error easy.

Fortunately, when an escape sequence is invalid, it gets printed instead of executed, which makes tracking down the error easy. It's harder to find the bug when the sequence is valid, but the data is not. Thus, the sequence

```
ESC$;"&a320C";
```

will be accepted, but unless the HMI is very small, the cursor ends up at the limits of the Logical Page and will appear not to have been executed. Escape sequences that are valid in format but not supported by the printer are simply ignored. The Rotate Text command, for example, is ignored by a Series II printer, since that command is supported only on the LaserJet III.

If you suspect a problem within a section of code, you can use two commands to help find the errant sequence. The Enable Display Function

```
ESC$;"Y";
```

and the Disable Display Function

```
ESC$;"Z";
```

(EscY and EscZ outside BASIC) will cause all escape sequences and control codes to be printed instead of being interpreted and executed. Note that the display functions should be used in conjunction with the PC-8 symbol set and with the end-of-line wrap enabled.

Two other commonly encountered problems show up on the printer display panel: Error 20, MEM OVERFLOW, and Error 21, PRINT OVERRUN. MEM OVERFLOW is caused by a program sending too many macros, too many soft fonts, or too much graphics data. When an Error 20 occurs, the only way out is to clear memory by powering the printer off and back on. The remedy is simply to add more printer memory or to reduce the number of macros, fonts, or graphics.

PRINT OVERRUN is reported when the data sent by a program is too complex

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CIRCLE 390 ON READER SERVICE CARD

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As you shop for a computer for use in your home, look for the FCC classification in the specifications or ask your vendor to recommend only machines that have been certified to the Class B limits. TV viewers and radio listeners in your home and in neighboring homes will be glad you did.

Lab Notes

for the printer to process. Data sent to the printer is stored in an intermediate format. It is then processed concurrently with the actual physical printing you can hear going on. An Error 21 occurs when the printer cannot process the data fast enough to keep up with the physical speed of the page as it moves through the printer. A frequent cause of PRINT OVERRUN when printing graphics is that the program sends commands to print a single point many times during the page run. The order in which printed objects are presented can also cause problems, as when the program sends data for a page and, near the end, has to try to print an object back at the top of the page. If the data is too complex, the portion of the page it tries to print to has already passed by the print drum. By rearranging the way objects are printed, this error can be avoided.

If sufficient extra memory is available, LaserJet III owners can use the Page Protect feature to avoid possible PRINT OVERRUN errors. By selecting the PAGE PROTECT=[page size]*, on the front panel, the HP LaserJet will process the complete page before it actually starts printing. The page size parameter is selected for your current paper size (LTR, Legal, A4 and so on).

Following is a list of telephone numbers for additional information and technical help:

HP FIRST—Fax Information Retrieval Support Technology, (208) 344-4809, lets you receive ap-notes, spec sheets, and more on your fax machine.

HP Personal Peripherals Assist Line—(208) 323-2551, provides general information and tech support.

HP Sales Information—(800) 752-0900, will provide product information and the address of your nearest dealer.

The HP Forum on CompuServe—GO HP, or GO CIS:HP from PC MagNet.

The examples and escape sequences presented here are a bare introduction to the many commands and features of the HP LaserJet Printer Command Language. With creative thinking and an understanding of how to use its language effectively, there is virtually no limit to what can be done with a LaserJet in every office. ■

Jay Munro is a staff programmer and graphic artist at Crescent Software.

by
Jay Munro

LZSELECT: Laser Printer Control The Easy Way

Paying the price for an HP LaserJet gets easier to justify with each passing year, but programming it to print just the way you want hasn't. Many of today's software applications handle routine LaserJet printing with ease, but if yours does not or if you need to set up your LaserJet for an unusual task, you face two formidable obstacles. First, you must decipher the cryptic PCL (Printer Command Language) escape sequences that must be sent to the printer. Second, you must figure out a way to get them there.

LZSELECT solves both of these difficulties. It gives you control over your LaserJet (or compatible) printer without your ever having to write a line of escape codes. And operating either by itself or in conjunction with Jeff Prosise's outstanding SETUP2 utility (*PC Magazine*, May 30, 1989), it provides a complete menu-driven system for setting up the LaserJet.

In case you're unfamiliar with it, SETUP2.COM is a memory-resident utility that pops up a menu of commands you can send to any printer from within most programs. The printer command menus are ASCII text files (called .PMF or Printer Make Files) and are displayed on-screen in pages of ten commands at a time. The PgDn and PgUp keys bring up lines beyond the first page. If you're familiar with the necessary PCL escape codes, you can construct .PMF files for the LaserJet with any ASCII text editor.

LZSELECT provides an easier way, however, because it knows all the codes that the printer needs and can even combine them in the approved PCL manner. It can create ASCII-format escape codes for SETUP2, send printer-ready escape sequences to the LaserJet directly, or output them to .DAT files you can later use from the command line or in batch files. Most of the PCL codes built into LZSELECT will work on the HP LaserJet Series II, IIP, and III printers, and those that are specific to the LaserJet III will simply be ignored if sent to earlier models. These last are grouped together so that you know which they are.

■ Without ever figuring out an escape code, you can set up your LaserJet to print exactly the way you want.

You can download an executable copy of LZSELECT from PC MagNet by following the instructions given in the sidebar, "LZSELECT by Modem." Because of space considerations, we are unable to print the source code here. However, you can also download the source code, LZSELECT.BAS (which is written for QuickBASIC 4, 4.5, BASIC 6 and BASIC 7 PDS) from PC MagNet. Or you can get the BASIC listing by mail or fax by sending a *postcard* with your name, address, and fax number (if applicable) to Utilities, *PC Magazine*, One Park Avenue, New York, NY 10016; Attention: Katherine West.

To create an .EXE program from the source using Microsoft QuickBASIC or BASIC 6, you enter the commands

```
BC /o /x LZSELECT;
Link /ex LZSELECT,,nul,LZS.LIB;
```

If you're using BASIC 7 PDS, you would enter

```
BC /o /x /s /fpa LZSELECT;
Link /ex LZSELECT,,nul,LZS7.LIB;
```

The library, LZS.LIB contains several assembler routines that support LZSELECT. After compiling, you can delete the .OBJ file created by BC. The SETUP2.COM, SETUP2.ASM, and SETUP2.BAS, along with complete instructions for using this utility, can also be downloaded from PC MagNet.

USING LZSELECT

Because LZSELECT does not use any data or configuration files, it can be run from any directory; if that directory is on your DOS path, you can run it from any DOS prompt. The command-line syntax for LZSELECT is

```
LZSELECT [/2] [/B] [/F filename]
```

While LZSELECT will ordinarily be used to build .PMF files for SETUP2, it also lets you send a set of commands directly to the printer for testing or setup. The optional /2 switch overrides the default LPT1 output port setting. Note that this printer port selection modifies only the printer port for LZSELECT's output; it does not affect SETUP2's operation. Note, too, that if your LaserJet is connected to a serial port, you will need to execute the DOS MODE command listed in the printer manual to redirect the output from LPT1 to your COM port.

LZSELECT tests the current display type and tries to set screen colors for best viewing. Laptop and portable PCs that use color display adapters with monochrome displays, however, can fool the program into using colors that look fine on a color monitor but are hard to read on plasma or

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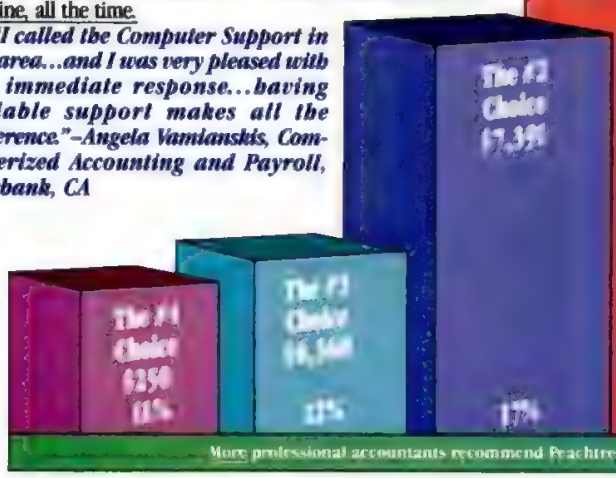

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LCD screens. The optional /B switch forces LZSELECT to use black-and-white for the default colors, making such screens easier to read.

The final optional switch allows you to enter a filename under which LZSELECT will store your subsequent command selections. If you don't supply a filename initially, you will be prompted for one when you save your selections. The path and filename you supply can be a maximum of 60 characters. Either way, if you enter a filename already in use, before saving the file later, LZSELECT will give you a chance to choose another name or to overwrite the original. Note: LZSELECT cannot load an already-created .PMF file for subsequent editing, even if you supply its filename initially with /F.

Most LZSELECT features are accessed by function keys or Alt-key combinations. Anytime after starting the program, pressing F1 will bring up the help screen shown in Figure 1. The Fill Pattern portion of this screen will serve as a guide to the six predefined patterns available through the Rectangular Fill section of LZSELECT.

As illustrated in Figure 2, the .PMF file format for SETUP2 consists of a menu title ("Hewlett-Packard LaserJet" is the default), followed by a series of menu text lines and associated escape codes. LZSELECT permits the use of up to 100 menu lines per file and up to 100 associated escape codes (or a total of 255 bytes) per menu line. You'll presumably never need so many codes, but it's nice to have all the flexibility you could possibly want.

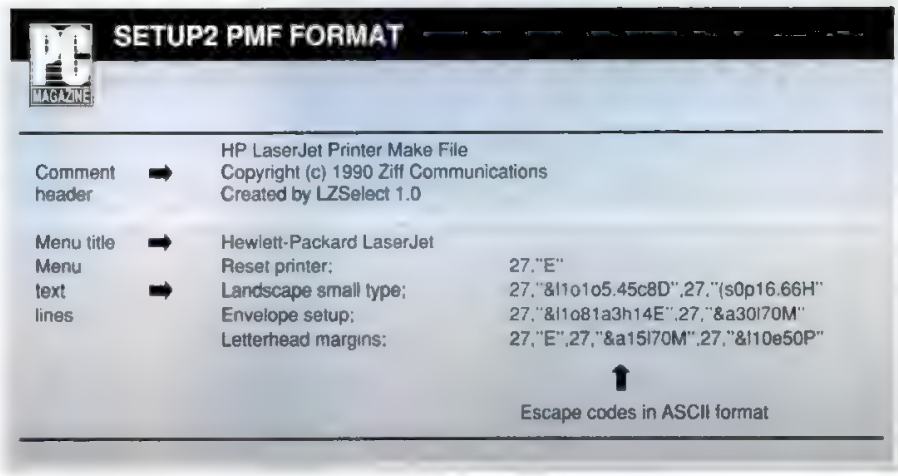

Figure 2: While capable of operating as a standalone program, LZSELECT will normally be used to create Printer Make Files (.PMF) for the SETUP2 utility published in our May 30, 1989, issue. When a .PMF file such as the one being created here, is loaded into SETUP2, its commands can be executed from a menu that pops up within an application.

For each menu text line (which will constitute the left portion of Figure 2 *and which can be displayed at any time by hitting the F5 toggle*) you can type in up to 20 characters. Like Envelope setup in Figure 2, this will usually be used for a brief description of the corresponding escape code sequence(s). After selecting the code sequences needed for a given menu item, you can press F2 to begin a new menu text item (Letterhead margins, for example).

LZSELECT prompts you to enter the first menu text item just as soon as it executes. When you have entered this, the main menu will be displayed, as shown in Figure 3.

Selection of the actual printer commands is done via a series of highlight-bar menus displayed on the left side of the screen. When you press Enter with the highlight on one of the 12 main menu categories (use the Up and Down Arrow keys to move the highlight) the various commands available under that heading will be displayed. Pressing Esc will take you back to the main menu.

If your menu text line reads "Initialize Printer", for example, the first command you would presumably select would be Printer Reset from the Job Control submenu. Simply highlight that command and press Enter. From the same submenu you might then select Portrait (or Landscape) orientation and hit Enter again. You might then Esc to the main menu and move down to pick a font to use when the printer is initialized.

As commands are selected, they are listed on the right side of the screen in the order they were entered. The escape sequences that correspond to each command selection are shown in SETUP2 (ASCII) format at the bottom of the menu screen. Note that 27 is the escape character and that the PCL command parameters are enclosed in quotes.

Figure 4 shows how LZSELECT looks during a typical command-selection process. In this illustration the menu text line is entitled "Weekly Report Setup" and the Cursor and Text category has been selected from the main menu. Note that if there are more than ten commands for a single menu text line, only the last ten will be shown, though the others entered previously remain in force.

The line length shown on the lower-

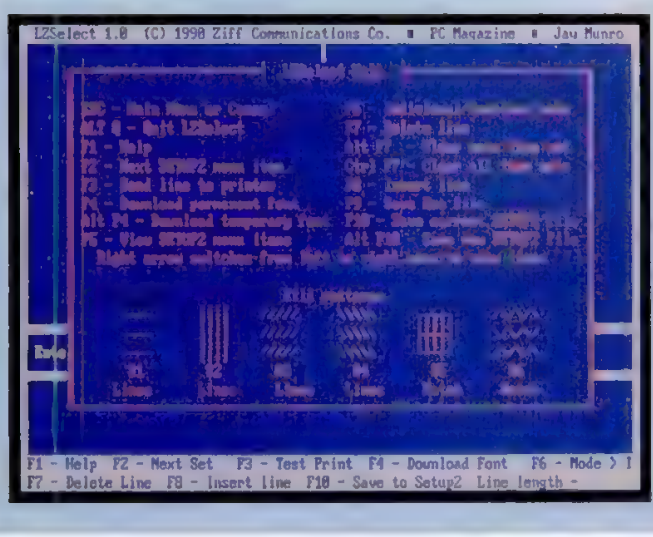

Figure 1: In addition to the keys whose functions are continuously shown at the bottom of the LZSELECT display, pressing F1 will bring up this Help Screen. The numbered Fill Patterns shown here are accessed from the Rectangular Fills submenu.

right side of the screen is updated with each new command selected and reflects the actual length in characters of the escape sequence being built. If a command selected puts the length over 255 bytes, the warning "Maximum instructions reached" will flash in the prompt area.

To send escape sequences longer than SETUP2's 255-character limit, one alternative is simply to use F2 to create two or more menu items. Their menu text descriptions could reflect the order in which they should be sent, for example

```
1 Report Setup
2 Report Setup cont.
```

A more elegant and efficient solution when faced with a menu line whose escape sequences total more than 255 bytes is to make use of PCL's provisions for combining commands. The sidebar "Grouping Escape Commands" explains the PCL rules, and the LZSELECT mode display, toggled by F6, indicates whether the escape codes are stored Individually (the default) or (when PCL rules permit) Combined. Combining the escape sequences is both more efficient and permits longer escape sequences to fit within the 255-byte limit for each menu item's codes.

When you select a command that requires an input parameter, a prompt and a text field pop up in the center of the screen. Depending on the command, the size of the text field will reflect the number of digits allowed for that command. Note, however, that while the field allows up to three digits for a right margin, a value of 999 columns will be ignored by the printer. It's up to you to stay within valid parameters, consulting your printer's manuals if necessary. Several commands, such as the cursor position, allow + or – signs as part of their input; the width of their fields has adjusted accordingly. (See this issue's PC Lab Notes for a discussion of relative cursor positioning.) For ease of editing, the LZSELECT text editor supports the Ins, Del, Backspace, Home, and End keys.

If you select a command by mistake, simply press F7, move the highlight bar onto the offending line, and press Enter to delete that line and update the display. Pressing Alt-F7 deletes all currently selected commands, if you want to change or cancel the entire menu item. To cancel and

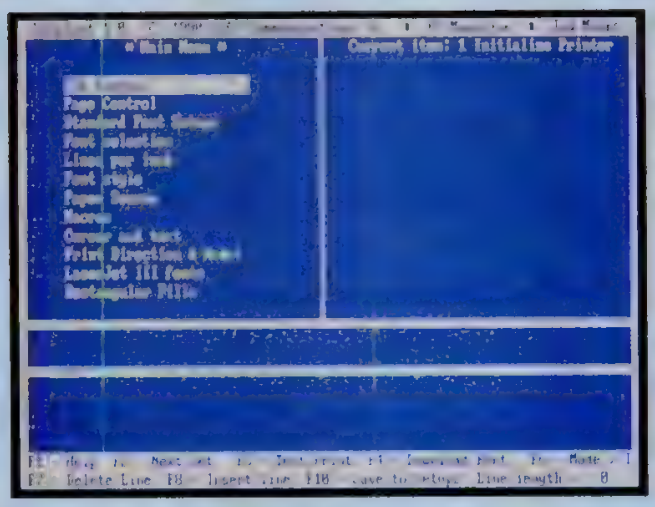

Figure 3: Each of the categories shown has a submenu of LaserJet commands you can select simply by highlighting and pressing Enter.

Figure 4: The escape codes for each of the commands selected are shown at the bottom of the LZSELECT display in ASCII-string form, suitable for use in SETUP2 .PMF files.

Figure 5: When a .PMF file created by LZSELECT is loaded into SETUP2 and brought up with Ctrl–Right Shift, the function keys shown will execute the selected codes directly.

restart everything, press Ctrl-F7.

Conversely, to insert a command between two that you have already selected, start by highlighting the command you want to insert from the command menu. Press F8 to put the highlight bar on the instruction list and move it to the line before which the new command should go. Then press Enter to insert it into the list. If the command needs your input, you will be prompted before the line is inserted. In both insert and delete modes, you may change your mind and cancel the operation by pressing Esc.

As previously mentioned, when you have completed your command selections for the current menu line item, pressing F2 will allow you to begin a new menu line entry. You'll be prompted for a new menu text description, and the last set of commands will be cleared from the display. If you change your mind after pressing F2, press Esc to return to the last menu line. Note, however, that after you have pressed Enter and the new menu item has been displayed in the instruction area, the previous item cannot be changed.

To save your .PMF file, press F10. You will be warned if a file with the same filename already exists. To overwrite an existing file, press Y at the warning. Once the file has been saved with the current name, each subsequent save will use the same name. If you want to change the filename, press Alt-F10 and you will be prompted for the new name, which will then become your current filename.

LZSELECT does not perform extensive error-trapping on filenames, however, so be careful to avoid names such as CON.TRL and NUL.FIL, as well as invalid filenames such as PRESET..PMF.

Once the file has been saved, press Alt-Q from the main menu to quit. If you try to quit before saving, LZSELECT will ask whether you want to save the file. LZSELECT keeps track of changes, so if you save a file once and then make an addition, you will be prompted to save again before exiting.

The .PMF file is now ready to be loaded into SETUP2, using the command

```
SETUP2 filename
```

SETUP2 will then load the LZSELECT .PMF file and become memory-resident. By default, SETUP2 uses the Ctrl–Right Shift key combination to pop up over a running application. As shown in Figure 5, SETUP2 uses function keys to send the commands you have identified with menu text descriptions to the printer. Subject to the usual TSR limitations, SETUP2 can be uninstalled from memory by entering

```
SETUP2 /U
```

As indicated at the outset, LZSELECT is by no means limited to operation from within SETUP2. In the sections that follow, we will explore some of LZSELECT's additional capabilities and learn how to handle any special situations you may encounter.

ADDITIONAL CAPABILITIES

LZSELECT gives you a choice between using standard and customized setups. To create your own setup for printing a spreadsheet with 16.67 characters per inch (cpi) in landscape mode, for example, you could begin by choosing Standard Font Setups from the main menu and then go on to select the font style, line spacing, and so forth with additional commands. On the other hand, for a quick, simple setup you might instead choose Landscape 16cpi from the Standard Fonts menu, and the full escape code for font, size, spacing and orientation will be selected in one shot.

LZSELECT does not impose any rules of its own on your command selections, so you must exercise some care in arranging them in the proper order. Sending a printer reset command, for example, clears all temporary fonts and macros, clears the HP LaserJet's print buffer and restores your power-on defaults. For this reason, you may want to position the printer reset at the beginning of the set of escape sequences, so it won't clear any instructions that may be sent in the same set. Note that a page eject is the usual side effect of sending a reset when data is present in the printer's

GROUPING ESC COMMANDS

by Jay Munro

The SETUP2 format requires that instructions be delimited by quotation marks, thus adding characters to the basic instruction and taking up more storage space. For example, a simple ten-column left-margin command is

```
27,"&a10L"
```

Adding a right margin of 75, this becomes

```
27,"&a10L",27,"&a75M"
```

Although this code is not itself terribly long, in combination with other commands the line *could* reach the 255-character limit. To prevent commands from becoming too lengthy, the PCL language of the LaserJet printers permits some commands to be combined and sent in groups.

Notice the similarities between the two commands above. Both, in addition to the 27, have the same first two characters, &a. In PCL jargon these are the Parameterized and Group characters. By dropping the second occurrence of the 27 (the escape character) and the redundant parameterized and group characters, the escape code can be shortened in a single command. The capital letter at the end of each of the sequences is called the Termination character. When codes are combined, all but the last termination character must be reduced to lowercase, but the *last* Termination character must be entered in uppercase. When combining the two sequences shown above, therefore, the resulting command is

```
27,"&a10175M"
```

This reduces the former total of 21 characters for the separate commands to a total of 13 characters, which is enough of a savings to be able (if needed) to add another command. Moreover, by grouping commands, less time is taken sending them, less disk space is used, and less printer memory is used.

Most, but not all, commands can be combined. It's important to remember that the ESC, Parameterized, and Group characters must be the same for any grouping. Moreover, advanced commands, such as macros, must never be grouped. So when in doubt, it's best to waste a little memory and use individual sequences. ■

memory.

Another printer command that is sensitive to the order in which it is used is the Orientation command. To ensure predictable results, changes between portrait mode (the default orientation) and landscape mode should be made only at the start of a new page. All HP LaserJet series II, IIP, and III printers can use only one orientation per page. But starting with the HP LaserJet III, a new command was introduced to change the print direction. Unlike page orientation, LZSELECT's Print Direction and Mode command allows text to be printed in any combination of portrait (rotate 0°), landscape (rotate 90°), reverse portrait (rotate 180°), or reverse landscape (rotate 270°) on a single page.

HANDLING SOFT FONTS

LZSELECT allows you to both download and select your LaserJet soft fonts. To download a *permanent* font—one that will not be deleted by a Printer Reset command—you begin by pressing F4. To download a font that can be deleted with a soft reset, hit Alt-F4. In either case, you'll be prompted for the name of the soft font to be downloaded. At the prompt, you must also enter the path, if the font is not in the current directory.

LZSELECT will then check to see if it can find the font, and if so, will prompt you for an ID number to assign. The font ID can be any number between 0 and 32,767, but you must *remember what it is*. By using different ID numbers you can download any number of fonts with LZSELECT, subject only to your printer's limits. Your LaserJet manual will tell you how many fonts your model can hold (32 for the LaserJet II, for example). Remember also that if you use large-point-size fonts, you can exhaust the printer's memory long before you reach this number.

To select a font you have downloaded, you specify the Soft Font ID # command from the Font Selection menu. (This is why you must remember the number you used.) LZSELECT will then send the command to make your selected font the LaserJet's primary font. All text will then be printed with that font until another is selected. If the Soft Font ID you specify has not been downloaded, the HP LaserJet printer defaults back to its current font.

THE CURSOR AND TEXT COMMANDS

A wide variety of commands is contained under this main menu category, including the Push Cursor and Pop Cursor commands you may use in connection with constructing LaserJet macros. (For further information on this subject, see the sidebar "Using Printer Macros.") One of the most versatile commands under the Cursor and Text Menu heading, however, is simply designated Enter Text.

If you need to create a special escape sequence that is not contained in LZSELECT, for example, you can choose the Enter Text option and simply type in the escape sequence you want, using the 27, commas, and quotes of the other commands as your model.

Again, sometimes you need to send more than just escape codes to the printer. The Enter Text option from the Cursor and Text Menu enables you to enter up to 244 characters to be printed. Depending on how much space is left of the 255-character maximum for a given menu line, LZSELECT will prompt you for up to four strings of 61 characters each. This odd-seeming number derives from the fact that although SETUP2 will accept up to 255, each string must include quotation marks and a comma, which takes up to 11 characters from the total. What's more, if you have already specified 130 characters of escape codes on a given menu line, you can enter only 119 additional characters. And you can, of course, always get a new menu line altogether by pressing F2.

LZSELECT's Enter Text option also provides a convenient way to print envelopes. Start by selecting Landscape mode from the Job Control menu, and the envelope size and Envelope Feed from the Paper Source menu. Then type in your return address using the Enter Text selection from the Cursor and Text menu, adding

USING PRINTER MACROS

by Jay Munro

Macros provide a way to execute repeated commands without having to reenter them each time. LaserJet macros are simply a collection of regular PCL commands that are surrounded by a Start Macro and an End Macro command and introduced by an identifying Macro ID number from 0 through 32,767. One macro can call another macro, although such nesting is limited to two levels. With a LaserJet Series II, up to 32 macros can be defined. With the LaserJet IIP or III, up to 32,767 may be created, assuming you have enough printer memory. LZSELECT supports all the LaserJet macro options currently available.

LZSELECT combines the ID specification command with the Start Macro command, making macro creation that much easier. To begin a macro, select Start Macro # from the Macros menu. Answer the prompt for a number and press Enter. Any subsequently selected commands—margin commands, font changes and styles, and even rectangular fills—will be recorded within the macro until you select either End Perm Macro or End Temp Macro.

If you want the macro to survive a printer reset, select End Perm Macro; otherwise, use End Temp Macro. The End Macro commands terminate only the last macro ID specified, so if you use the Set New Macro # to nest a macro, be careful to end both macros by setting the original macro number and calling End Macro again to finish.

Once created, a macro can be executed, called, or overlaid. When a macro is *executed*, any changes to the printer settings (such as font changes) made within the macro will "stick," remaining in effect even after the macro commands are done. If the macro is *called*, the changes will be discarded when the macro is done, the one exception being the cursor location. When a macro is *overlaid* it is called automatically at the end of each sheet printed. Overlays are good for making footers or letterhead paper. If the cursor location must be preserved on a call or overlay, select Push Cursor at the start of the macro and Pop Cursor at its end from the Cursor and Text menu.

There is one caveat when using macro commands: Do not save them in the combined mode with LZSELECT. Because most of the macro escape sequences have the same parameterized and group characters, if they were combined, they would all end up being grouped together, which would make the macro end as soon as it started! ■

LZSELECT BY MODEM

The programs published in *PC Magazine* are available by modem from PC MagNet.

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To download LZSELECT.EXE or its QuickBASIC source listing, log on to PC MagNet. Enter GO UTILITIES or choose PC MAGAZINE UTILITIES from the top menu, then DIRECT UTILITY DOWNLOAD from the next menu. Enter the filename, then select the file you want to download from those presented. Answer yes (Y) to DO YOU WISH TO DOWNLOAD? Press Enter to see the transfer protocols. Choose a protocol and download the file.

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LZSELECT Command

Jay Munro — January 29, 1991(Utilities)

Purpose: Constructs and sends LaserJet escape sequences either directly, via a SETUP2.COM (*PC Magazine*, May 30, 1989) menu (PMF) file, or via a DOS file that can be COPYed to the printer from the command line or used in a batch file.

Format: `LZSELECT [/2] [/B] [/F filename]`

Remarks: The optional /2 and /B parameters set LZSELECT to use LPT2 for its own printer output and a black-and-white display for an LCD or plasma screen. If a filename to be opened for construction of a SETUP2 Printer Make File menu is not supplied initially using the /F switch, one must be supplied at the first screen. A descriptive menu text line of up to 20 characters is then entered, after which highlighted selections from the LZSELECT menus automatically build the command escape sequences (up to 100 ESC codes or 255 bytes per line). These are displayed in the default ASCII-string (SETUP2) format at the bottom of the screen. Prompts are supplied for required parameters.

F6 toggles between combining command sequences where HPPCL rules permit and keeping them as individual strings. A selected command can be deleted with F7 and inserted with F8. Alt-F7 clears all current commands for that menu line, and Ctrl-F7 clears all current commands in the file. New menu command lines, up to 100 per file, can be opened with F2. Files can be saved in .PMF format with F10; Alt-F10 prompts you to save under a new filename. Selected commands can be converted into regular printer command sequences and sent directly with F3, or they can be converted and saved as a COPYable DOS file with F9.

Text or escape strings not contained in LZSELECT can be manually entered in ASCII-string form, using the Enter Text command from the Cursor and Text menu selection. F4 and Alt-F4 are used to download soft fonts as permanent and temporary, respectively. They prompt for a filespec and a Font ID number (0–32,767) which is also used when that font is selected for use by a printer command.

A PMF menu prepared by the LZSELECT file can be loaded into SETUP2 by entering

SETUP2 *filename*

SETUP2 is a memory-resident utility that uses Ctrl–Right Shift for its hotkey to pop up over a running application. Like LZSELECT, SETUP2 and its related files can be downloaded from PC MagNet.

the necessary carriage returns and line-feeds selected from the same menu.

After entering the return address, add a couple of line-feeds and then use the Left Margin command from the Page Control menu to set the left margin to 35. This part of the envelope printing task might well constitute a menu item by itself, so that when SETUP2 sends the codes, the envelope will be set up to have the return address in the upper-left corner and will be ready for you to type in the addressee. You can then use SETUP2's direct mode (accessed from the SETUP2 menu by pressing the forward slash (/)) to send the name and address lines, enclosed within quotation marks, to the printer. To print out, either send a form-feed from SETUP2, or press the Form Feed button on the HP LaserJet printer. The printer will prompt you to insert an envelope and print.

OUTPUT MODES

The escape sequences you build with LZSELECT can be output in two forms that are somewhat different: SETUP2 ASCII-format escape sequences or printer-ready escape sequences. The escape sequences used by SETUP2 are actually *pseudocodes* that must be interpreted and then converted into the codes that the printer can understand as commands. SETUP2 interprets these pseudocodes by sending an escape character (^[) in place of the 27 and by stripping away the quotes and commas. The control characters—form-feed (12), line-feed (10), and carriage return (13)—are also converted to their ASCII equivalents (♀, ◙, ♪) before being printed.

As escape sequences are built, LZSELECT stores the codes in the SETUP2 format, which is displayed on the lower portion of the screen. When F10 is pressed, these codes are saved to a file, ready to be used by SETUP2.

To send the codes you construct directly to the printer *without* going through SETUP2, hit F3. Pressing F3 converts the ASCII-format codes into actual escape sequences the printer needs and sends them out through the LZSELECT printer port you specified on the command line (LPT1 is the default). Using F3 is not only a handy way to test an escape sequence; it can also be used to make a quick printer setup you will not be repeating often.

Further, LZSELECT can build a *file* of printer-ready escape sequences that can be copied directly to the printer from the command line or used in a batch file. You may prefer this method to using SETUP2 if you have a single printer setup or your application program has problems with TSRs. Pressing F9 brings up a prompt for a filename under which to store the current set of escape sequences. The file will contain only actual printer codes, without menu items, headers or comments, and the like.

As an illustration, let's assume you need to print five copies of a daily computer usage log, LOGFILE.DAT—one for each accountant in your company. The format must be landscape mode, and in the line-printer font to fit on one page.

Using LZSELECT, you would choose the commands for Reset, the Landscape 16.66 pitch font, and 5 copies. Since this is a daily chore, you want to create a batch file to do it, so you press F9 to enter a descriptive filename—5PAGE.DAT—and then press Enter. The file 5PAGE.DAT now contains the printer escape sequences that are needed to tell the printer to format and print five copies of each page of text sent.

You can then create the batch file in which you need to place 5PAGE.DAT by going to the command line and entering

```
COPY CON PRINT5.BAT
COPY 5PAGE.DAT LPT1
COPY LOGFILE.DAT LPT1
ECHO ^L > LPT1
```

The form-feed character (^L) in the last line is entered by pressing Ctrl-L. (It can also be entered by holding down the Alt key, typing 12 on the numeric keypad, and releasing Alt.) To save the file, press Ctrl-Z or hit F6 and then press Enter. The DOS message "1 File Copied" shows the batch file has been saved.

When the batch file is run, the page setup escape codes created by LZSELECT are copied to the printer, then the LOGFILE is copied, followed by the form-feed command to finish the job. The filenames you select can differ, of course, but the format will be the same.

As a final note, *WordPerfect* users will be interested to know that they can also use LZSELECT to create printer command files for special setups. In order to invoke your custom command file from *WordPerfect*, press Shift-F8 for format, select O for Other, P for Printer functions, P again for Printer command, and F for Filename. At this point, enter the name of your custom command file, and press Enter twice. When your document is printed, *WordPerfect* will send the file to the printer at the point you selected. One word of caution is in order: If you change printer parameters, such as margins, fonts, and so on, *WordPerfect* may give unpredictable results. You should consult the *WordPerfect* manual if you want more details on this subject. ■

Jay Munro is a staff programmer and graphic artist at Crescent Software.

PC MAGAZINE UTILITIES UPDATES

Like all good software, the programs presented in *PC Magazine* are upgraded and improved. The only way to obtain the modified versions is to download them from PC MagNet. Here is a partial list of the programs that have been upgraded to fix minor bugs and system incompatibilities:

ANSI.COM, Version 1.3
BEN55.ARC (Benchmark Series, Version 5.5)
CARDFILE.COM, Version 1.1
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DIRMATCH.COM, Version 1.1
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SNIPPER.COM, Version 1.2
TPFST-AT.COM, Version 1.1
ZCOPY.COM, Version 1.2

For a complete list of all the programs available from the PC MagNet Utilities Database, download UDCAT.ARC.

A downloadable index to *PC Magazine*'s product reviews is also available. PCM.EXE is a self-extracting file that contains the *Computer Library PC Magazine* Reviews Index for January 1988 to June 1990. It requires the search files in PCSRCH.EXE. Please read the information file PCM.INF before you download any of these files. ■

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TAPCIS is a $79 shareware program you can download from our Tips Forum (GO PCM:TIPS): CIS Nav Tips Library, Library 11. The latest version is TAP.EXE, Version 5.3; its documentation file is TAPDOC.EXE. Give the program a spin for a 21-day no-obligation period, with the knowledge that technical support is available in the TAPCIS Forum on CIS and that the program comes with a 90-day money-back guarantee.

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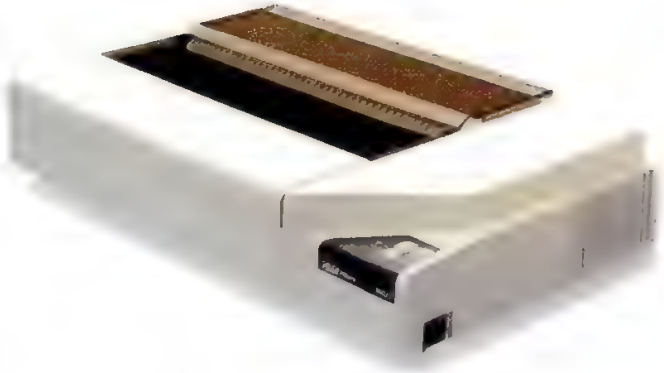

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CIRCLE 245 ON READER SERVICE CARD

by
Charles Petzold

Environments

An Introduction to Color Selection In Windows

In the past several Environments columns, I've discussed how color is handled under the OS/2 Graphics Programming Interface (GPI), but I've stopped short of discussing the new palette manager in the beta versions of OS/2 2.0.

The palette manager in OS/2 2.0 is not all that different from the palette manager introduced in *Microsoft Windows* 3.0. In future columns, I'll discuss both of these palette managers. In preparation for this, let's first examine basic color selection in *Windows*.

The OS/2 GPI supports five graphics primitives for which color can be set—lines, filled areas, text, markers, and images. You use GpiSetColor and GpiSetBackColor to set the foreground and background colors for all five primitives together, or GpiSetAttrs to set color (as well as other attributes) for each primitive separately.

The *Windows* Graphics Device Interface (GDI) supports three graphics primitives for which color can be set—lines, filled areas, and text. Setting color for each of these primitives is handled differently.

24-BIT COLORS AGAIN

When you are programming for the *Windows* GDI, you specify color using a 32-bit integer. The high 8 bits are set to zero. The lower 24 bits are divided into 3 bytes representing the levels of red, green, and blue:

```
+--------+--------+--------+--------+--------+
00000000|   Blue   | Green  |   Red
+--------+--------+--------+--------+--------+
```

The lower 24 bits are sometimes referred to as a 24-bit RGB (red-green-blue) color value. Each of the red, green, and blue values can range from 0 through 255. When all 3 bytes are 0, the color is black. When all 3 bytes are 255, the color is white.

This is similar to the 24-bit color values used in the OS/2 GPI, but the ordering of the bytes is different. Here's how the bytes

- An examination of color selection in *Windows* paves the way for a future comparison of *Windows* and OS/2 palette managers.

are encoded in GPI:

```
+--------+--------+--------+--------+--------+
00000000|   Red    | Green  |   Blue
+--------+--------+--------+--------+--------+
```

The WINDOWS.H header file defines a data type named COLORREF for working with the GDI color values:

```
typedef DWORD COLORREF ;
```

The *Windows* DWORD (double word) data type is defined as an unsigned long integer. Although the *Microsoft Windows Programmer's Reference* uses the COLORREF data type for documenting function calls and data structures, COLORREF is not used at all in the WINDOWS.H header file beyond the initial definition!

WINDOWS.H contains four macros for working with color values. The RGB macro converts 3 red, green, and blue bytes into the composite 32-bit COLORREF value. For example,

```
RGB (0xFF, 0, 0)
```

is the value 0x000000FF, or bright red. Three other macros—GetRValue, GetGValue, and GetBValue—extract the red, green, and blue bytes from a COLORREF value.

With the introduction of the palette manager in *Windows* 3.0, COLORREF values sometimes do not simply specify red, green, and blue levels. But I'll get to that in a future column when I discuss the palette manager itself.

COLOR INDEXES VS. 24-BIT COLORS

By default, color selection in the OS/2 GPI involves color indexes rather than 24-bit RGB values. There are 16 standard color indexes, each of which is associated with an identifier defined in the PMGPI.H header file beginning with the prefix CLR. These 16 color indexes correspond to the 16 standard colors available on EGA and VGA video boards.

But GPI also provides the GpiCreateLogColorTable function that (among other things) lets you enable the presentation space to use 24-bit RGB values directly to specify color, and this approach, of course, is the most flexible. It especially makes sense if you're running a 24-bit color video board that allows the display of 16 million colors simultaneously.

However, most of the video adapters used today for running *Windows* and Presentation Manager can display only 16 colors simultaneously. Additional colors must be simulated through the process of *dithering*. A dithered color is essentially a pattern of two or more color pixels that gives the appearance of a color not directly displayable by the video board. For example, if a filled area alternates black

pixels and dark red pixels, you'll see a red that is darker than dark red.

Unfortunately, dithering works well only for area filling. Lines and text can't be dithered without distortion, so that dithered text is nearly unreadable. For this reason, both GPI and *Windows* use pure undithered colors for lines and text.

If OS/2 is running on a system with an EGA or VGA board and a color monitor, the 16 color indexes are quite convenient for specifying pure undithered colors. But in *Windows* you must use 24-bit RGB color values. The question arises: Which of these RGB color values correspond to pure colors? This question won't be fully answered until the next issue.

LINES, PENS, AND COLORS

As we've seen in previous columns, you specify a color for drawing lines in the OS/2 GPI using GpiSetColor or GpiSetAttrs. These functions set the line color attribute in the presentation space. This attribute affects all subsequently drawn lines.

In the *Windows* GDI, you specify line colors with a *logical pen*. In effect, you create a pen *object* that has a device-independent style, width, and color. You do this by calling

```
hpen = CreatePen (nStyle, nWidth,
 crColor) ;
```

Alternatively, you can set the fields of a LOGPEN (logical pen) structure and call

```
hpen = CreatePenIndirect
 (&logpen) ;
```

The LOGPEN structure is defined as follows:

```
typedef struct tagLOGPEN
 {
 WORD  lopnStyle ;
 POINT lopnWidth ;
 DWORD lopnColor ;
 }
 LOGPEN ;
```

The *style* of the pen is one of seven identifiers beginning with the PS prefix, such as PS_SOLID, PS_DASH, or PS_DOT. The color is specified as a 32-bit COLORREF value.

The width of the pen is generally in *logical coordinates*. (Logical coordinates in the *Windows* GDI are roughly equivalent to presentation page coordinates in the OS/2 GPI. There are no equivalents in GDI to the GPI world and model coordinates.) However, a width of zero indicates a line width of one pixel, regardless of logical units.

In the CreatePen function, the width of the line is an integer. In the LOGPEN structure used with CreatePenIndirect, the width of the line is a POINT structure. A POINT structure has two fields—x and y, but only the x field is used for the line width.

Both CreatePen and CreatePenIndirect return a handle to a logical pen. The next step is to select this pen in the device context:

```
SelectObject (hdc, hpen) ;
```

The **hdc** parameter is the handle to a *Windows* device context, which is equivalent to the GPI presentation space. Following the call to SelectObject, any lines you draw will use this pen.

When the logical pen is selected in the device context, *Windows* may need to approximate the pen for drawing. For example, for all the line styles except PS_INSIDEFRAME, GDI uses a solid undithered color. If the requested color is not available on the device, *Windows* approximates it using one that is.

Note that the logical pen is independent of the device context. You can select the pen into either a video display device context or a printer device context. Depending on the color capabilities of the output device, the logical pen may be approximated in different ways for actual drawing.

Any pen objects you create must be deleted by calling

```
DeleteObject (hpen) ;
```

But they can't be deleted while selected in a valid device context.

To delete a pen that you've created and selected into a device context, generally, you first select one of the *stock pens* in the device context. You obtain a handle to a stock pen by calling GetStockObject with a name of a stock pen—WHITE_PEN, BLACK_PEN, or NULL_PEN, and pass this handle to SelectObject. You can then delete the pen you've created. Conveniently, when you use SelectObject to set a new pen in the device context, the function returns the handle of the pen previously set in the device context.

It's very important that a *Windows* application deletes any pens—or other GDI objects—that it creates. These logical pens are stored in a data segment that belongs to the GDI dynamic link library module. The logical pens are not automatically deleted when the application terminates.

ATTRIBUTES VS. OBJECTS

You can immediately see a major conceptual difference between selecting line colors in GPI and GDI: In GPI, you set a line-color attribute for the presentation space. In GDI you create a logical pen object that has the desired color and then select the pen into the device context.

The *Windows* approach may seem more "modern" because it uses something called an object, and of course this brings to mind object-oriented programming. But the *Windows* pen is certainly not an object in any object-oriented programming sense. We've come to view objects as combining code and data. The *Windows* pen is only data—a description of a pen. Moreover, there is no concept of inheritance or anything else normally associated with object-oriented programming.

The process in GDI of creating a logical pen, selecting it into a device context, and then deleting the pen (but not while it is still selected in the device context) is certainly more cumbersome than setting a line attribute in GPI. Does the GDI approach have any advantages?

Perhaps. Suppose you want to create multiple logical pens and then select them into a device context at various times for drawing on the window or a printer. Once the pens are created, selecting them into the device context is very simple.

You can approach this simplicity in GPI using GpiSetAttrs. First you initialize multiple LINEBUNDLE structures that describe the style and color of the lines you want to draw, and then you pass pointers to these LINEBUNDLE structures to GpiSetAttrs. However, the GpiSetAttrs function is not nearly as simple to use as the *Windows* SelectObject function.

Moreover, if the number of different line styles and colors that the program needs is not known until runtime, then the program must first allocate memory (probably using **malloc**) for the various LINEBUNDLE structures, and later free that memory. *Windows* effectively does this job of allocating and freeing memory for you when you call CreatePen and

DeleteObject. On the other hand, *Windows* will not automatically free the memory if your application terminates.

LINE WIDTHS

Another big difference between the *Windows* GDI logical pens and the OS/2 GPI line-drawing attributes involves line width. The *Windows* GDI allows setting a line width in logical coordinates. However, if the physical width is greater than one pixel, then the pen style can't use dashes or dots. The pen style must be PS_SOLID (which is a normal solid line), PS_NULL (which is a pen that doesn't draw), or PS_INSIDEFRAME. The color of the line will be a solid color for PS_SOLID and a dithered color for PS_INSIDEFRAME.

GPI allows setting two different types of line widths. The first is called the *cosmetic* line width. The cosmetic line width is invariant under GPI transforms. Under the latest beta version of OS/2 2.0, the cosmetic line width can be either normal or thick. The thick line is twice the width of the normal line. These lines may use any dotted or dashed style.

The second type of line width supported under the OS/2 GPI is the *geometric* line width. The width of the line is specified in world coordinates, but the line must be drawn as a path. The interior of the line is filled with the current pattern selected in the presentation space.

LOGICAL BRUSHES

The second GDI graphics primitive is the *filled area*. Areas in GDI are filled with a *brush* (which is also called a *pattern*). In the OS/2 GPI, you set a pattern, color, and style by setting attributes in the presentation space. In the*Windows* GDI, you create a logical brush and select that into the device context. *Windows* 3.0 contains five functions for creating a logical brush:

- CreateSolidBrush creates a brush of a solid color. Its single parameter is a COLORREF value. The function returns a handle to the brush.
- CreateHatchBrush has two parameters: the style of the brush (one of six identifiers beginning with the prefix HS (meaning hatch style), such as HS_CROSS or HS_VERTICAL), and a COLORREF value.
- CreatePatternBrush creates a brush out of a bitmap. The single parameter is the handle to the bitmap. (This GDI function is easier to use than the equivalent procedure in GPI where you first use the GpiSetBitmapId function to associate the bitmap with an ID value. You then use GpiSetPatternSet to set the pattern attribute to this ID.)
- CreateDIBPatternBrush is new with *Windows* 3.0. This creates a brush from a *Windows* 3.0 device-independent bitmap (or DIB). I'll discuss DIB's in a future installment of Environments.
- CreateBrushIndirect encompasses all of the above functions using a LOGBRUSH structure:

```
typedef struct tagLOGBRUSH
  {
  WORD   lbStyle ;
  DWORD  lbColor ;
  int    lbHatch ;
  }
  LOGBRUSH ;
```

Using the structure is rather complex because the **lbStyle** field (which indicates whether the brush is solid, hatched, or created from a bitmap or DIB) can alter the meanings of the other two fields. Almost two pages in the *Microsoft Windows Programmer's Reference* are devoted to this structure.

Each of the five functions that create a logical brush return a handle to the brush. You select this brush into the device context using SelectObject, the same function you use with logical pens. (GDI is able to determine the type of object by the handle passed to this function.) Any subsequent drawing you do that involves a filled area will use this brush.

THE GUI OF THE 1990s

by Charles Petzold

I've always thought of the Environments column as a window (so to speak) into the future of computing on the IBM PC. It's obvious to me that this future involves a graphical user interface (GUI). In this column I've covered OS/2 and Presentation Manager programming almost exclusively, because—despite some technical and marketing problems—I've always had faith that the industry leaders and the public would move in this direction.

This is no longer quite so evident. In case you haven't heard, Microsoft has apparently decided that *Windows* is the future and the OS/2 Presentation Manager is irrelevant. Microsoft has enough power in this industry so that what it decides will probably come to pass. Apparently IBM will still push PM, but IBM has never had much success in setting PC software standards.

To anyone familiar with the *Windows* and Presentation Manager application program interfaces, this is an unfortunate turn of events. Abandoning PM means that the PC industry will be saddled with a third-rate graphical interface.

Microsoft Windows 3.0 is like one of those cheap imitation sports cars exhibited in airline terminals. At first glance, the car can be quite striking. But as you get closer and discover what's underneath the hood, the initial appeal diminishes. You discover the flimsy fiberglass body and the Volkswagen chassis. The car may look nice, it may even run reasonably well, but it just doesn't have the power implied by its appearance. Even when you floor the gas pedal, you're not going to get anywhere very fast.

Unfortunately, the Microsoft hype-machine has more horsepower than *Windows* itself. This hype-machine has been in high gear for *Windows* 3.0, speeding like a Porsche 959, destroying everything in its path and towing *Windows* behind it.

Microsoft once had vision—an inspirational vision the entire computer industry could rally behind. This is no longer the case. Its vision now lifts no higher than the bottom line.

So, what direction should the Environments column take at this point? I'm not certain. The last thing I want is for this column to become irrelevant and focus on a graphical interface that no one programs for or uses. For the time being, I'll cover both PM and *Windows* programming, sometimes bouncing back and forth from one column to the next, sometimes comparing and contrasting. This isn't something I enjoy. When the dust settles on this issue, I'll once again attempt to maintain a stronger focus in this column. If Microsoft and the rest of this industry decide that *Windows* is the future, so be it. ■

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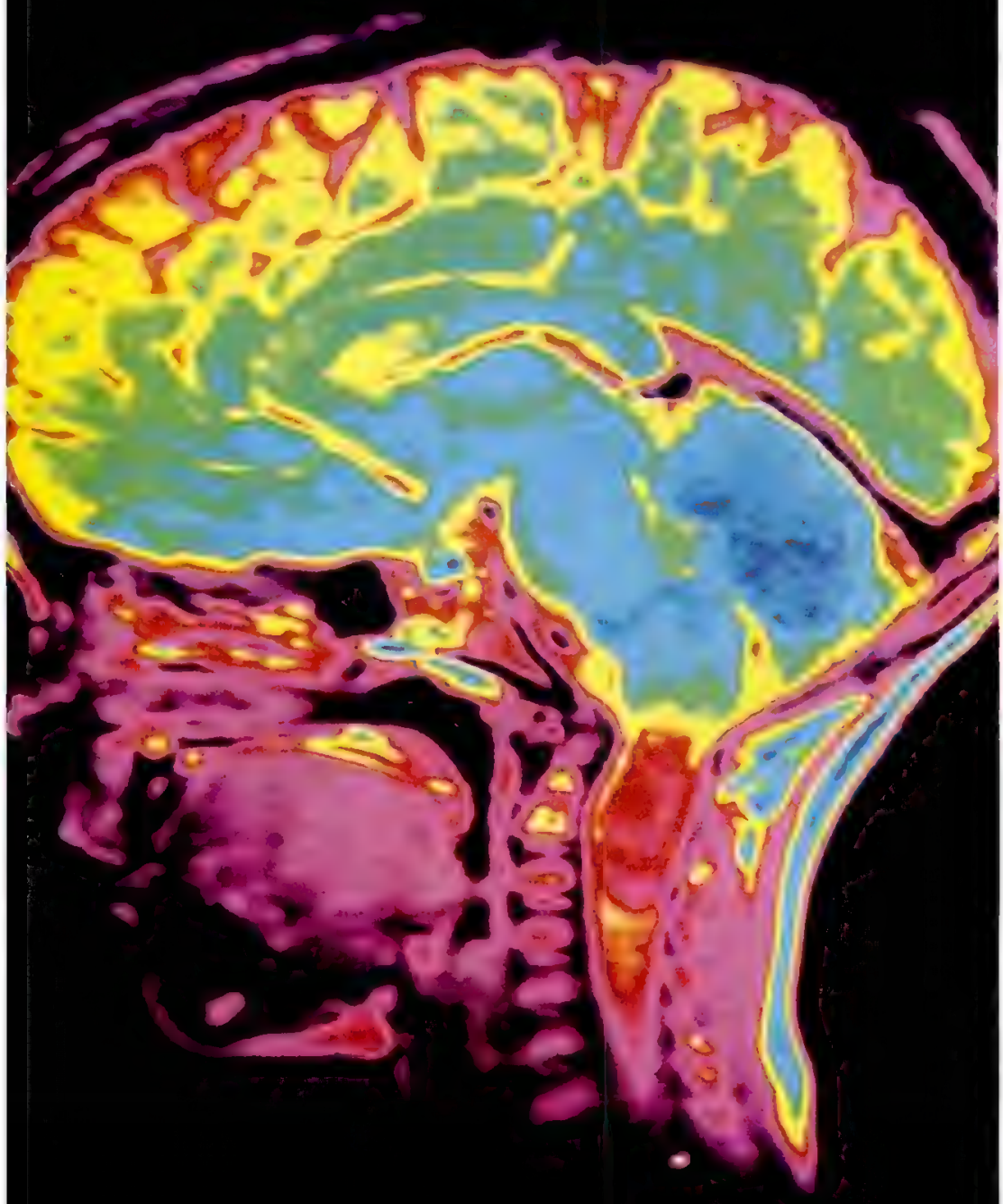

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If the brush is created using CreateSolidBrush, *Windows* will use a dithered pattern to approximate the desired color. For a brush created with CreateHatchBrush, *Windows* will use a pure color that approximates the desired color for drawing the hatch marks of the pattern.

TEXT COLOR

The third *Windows* GDI graphics primitive is text. Although you choose various fonts by creating a logical font and selecting the font into the device context, the logical font does not include a text color. Instead, the text color is an attribute of the device context.

Set the text-color attribute by calling

```
SetTextColor (hdc, crColor) ;
```

Windows will use a pure color that approximates the requested color. You can also direct GDI to color in the background area when you display text, in which case the background color can be set with

```
SetBkColor (hdc, crColor) ;
```

These functions for selecting text color come closest to the approach used in the OS/2 GPI.

The text color and background color affect more than just text. If you use GpiCreatePatternBrush to create a brush from a monochrome bitmap, then the text color and background color are used for the color of the pattern. The background color can also affect the color GDI uses for drawing the background of dotted or dashed line styles, and when drawing the background of a hatch pattern.

You can use the GetTextColor and GetBkColor functions for obtaining the current text and background colors set in the device context.

EXCEPTIONS TO THE RULE

Several GDI drawing functions use colors or brushes directly in the function call. The SetPixel function colors a single pixel, and the color is specified in the function directly. There are two other functions—FloodFill and ExtFloodFill—that also use direct COLORREF values.

The FillRect, FillRgn, FrameRect, FrameRgn functions fill or frame a rectangle or a region. These functions use a logical brush handle passed directly to the function rather than the brush selected in the device context, as does the GrayString function.

QUERYING AVAILABLE COLORS

In the past few columns, I've discussed the extensive color table support under the OS/2 GPI. Besides allowing a PM application different ways of specifying color, GPI has several functions a program can use for determining the colors available on an output device.

This is where *Windows* is seriously lacking, but in the next issue I'll examine a couple of functions—GetDeviceCaps, GetNearestColor, and an Escape function—that let you obtain this information. ■

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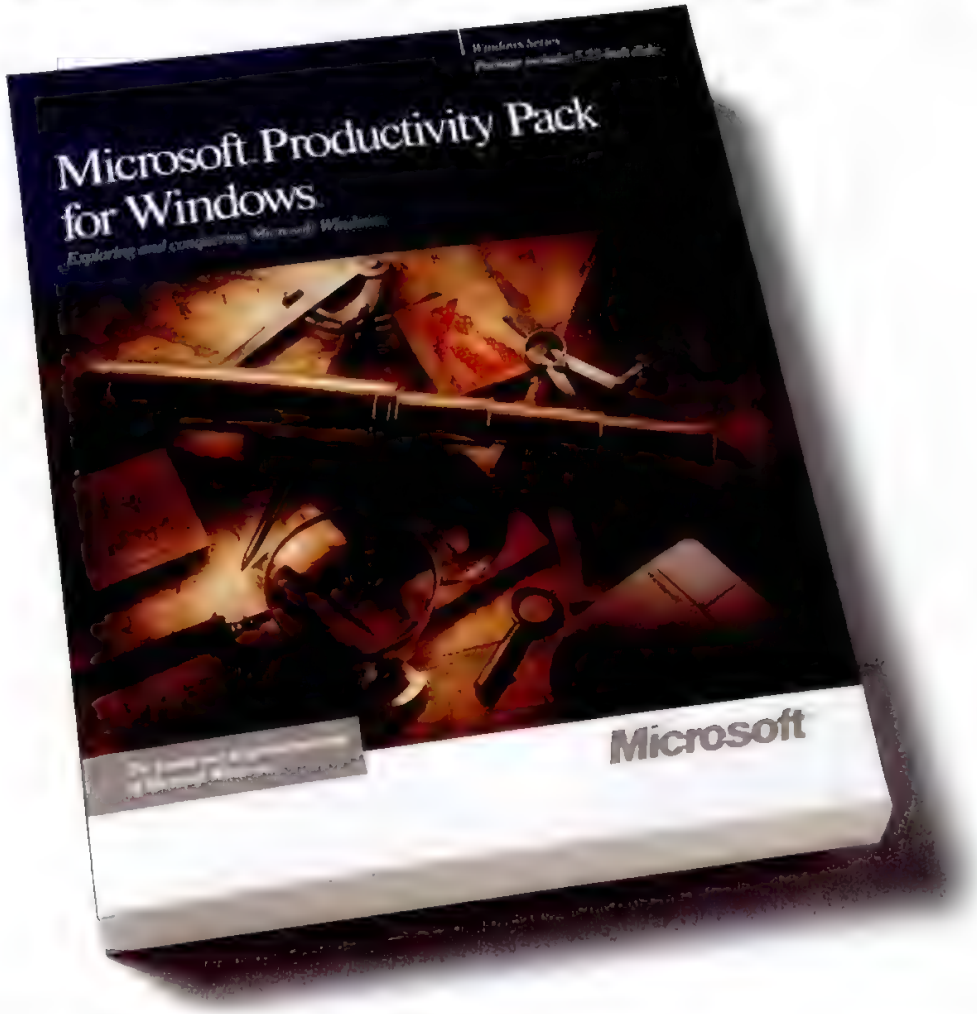

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by
William S. Hall

Windows

CREATE YOUR OWN ICONS

In the September 11, 1990, article "Windows 3.0 Under the Spotlight," you said the *Windows* accessory Paintbrush can be used to "design or modify icons." Could you tell me how to make these custom modifications? I can't find any information in the *Windows* manual.

Lawrence C. Winger
Falmouth, Maine

Unfortunately, this statement is not quite true: while you can use Paintbrush to create the images, you can't save them as icon files. However, Len Gray of Impact Software offers a solution with his shareware program, PBICON. Simply create your image in Paintbrush and then paste it into PBICON, where you can save the result as an icon file.

The size of the image doesn't matter: Draw it to scale as a 32- by 32-pixel rectangle or design a larger image, which PBICON can then shrink to icon size during the paste. You should note that 32 by 32 is a square set of pixels, but the icon may not appear square on your machine. The shape depends on the aspect ratio of your display. On a VGA (1:1) and EGA (4:3), 32 by 32 does look like a square; but on a CGA or 8514/A, the natural icon size is 32 by 16 and 64 by 64, respectively. So a 32-by-32 icon looks funny on these displays. Moreover, the icons you can develop have 16 colors. Thus, again they are most useful on EGA and VGA displays.

Once you've created an .ICO file, you can use it in the Program Manager to represent a file. Pull up the group where you want to put the icon and make sure the icon to be replaced is highlighted. Select the Properties command on the Program Manager's File menu to bring up the Program Item Properties dialog box. Click on Change Icon, and in the File Name box, type in the full path and filename of the new icon. Click OK, then click OK again, and *Windows* will display the new icon in the program group you selected.

- CREATE YOUR OWN ICONS: Some fine and often simple development tools can help you do the job, and many of them are available from PC MagNet.
- WHEREVER THE DATA IS: Automatically change the current directory to the one you want when you execute a program.
- MISSING PRINT SCREEN: In *Windows* 3.0 real and standard modes, you'll need help from a simple command in order to dump text directly to the printer from your DOS shell.
- MORE ABOUT PRINTSCREEN: When capturing an image in *Windows*' enhanced mode, circumvent the size limitation of the visible window.

Until the advent of *Windows* 3.0, only *Windows* programmers were interested in creating icons. Things have changed—now everyone wants to get into the act—but most of the good tools are only parts of *Windows* development utility packages. The *Windows* Software Development Kit (SDK) offers SDKPaint, which you can use to create icons, cursors, and small bitmaps. EdenSoft (Berkeley, California, 415-548-3554) offers a package called *Resource Workshop*, which also contains a tool for creating icons.

If you want to make icons primarily for VGA and EGA displays, try ICONDRAW, a shareware program created by Philip B. Eskelin. ICONDRAW allows you to create 32 by 32 pixel icons in 16 colors. Unlike PBICON, this program does not need Paintbrush; simply draw the image and save it to a file. Install the icon using the procedure described above.

If you don't want to draw icons yourself, download collections of them from PC MagNet and CompuServe. There, you'll also find bitmaps that you can use for wallpaper.

If you want to manage your icons by placing them in one or more libraries, try James M. Curran's ICONDLL, which is available on CompuServe. You'll need the Microsoft Resource Compiler (which comes with the *Windows* SDK) to carry out part of the process. In the current directory, ICONDLL creates a temporary .RC file listing all icons found there. It then runs the RC compiler to combine them into a single file that the Program Manager can read. In this way, you can use the View Next button when you are in the Add Icon dialog box to page through the selections. It's more convenient to have all icons stored in one place, and you can save some disk space as well.

You can download PBICON and collections of icons and bitmaps from the PC MagNet UTILFORUM. ICONDRAW is available from UTILFORUM, LIB10.

WHEREVER THE DATA IS

If a *Windows* program is in your path, you can run the program and automatically make any directory current. You simply use the File Properties menu to indicate that the program is located in the directory you want, even when it isn't.

Suppose you want to run *Word for Windows*, and WINWORD.EXE resides in C:\WINDOWS\WINWORD (which is in your path). If you want to change the directory to D:\WFW\DATA when you click

on WINWORD's icon, follow three steps:

First, create a new program item: pull up one of your Program Groups, select File, New, and press Enter to accept the Program Item default. Then enter

```
D:\WFW\DATA\WINWORD.EXE
```

in the Command box and type in an appropriate description.

Next, replace your WINWORD icon with the new one: Click on Change Icon (or press Alt-I), type WINWORD.EXE as the filename (it's on the path, so *Windows* will find it when you run the program), and hit Enter. Note: if you skip this step, you'll get a default icon, because WINWORD.EXE is not actually in D:\WFW\DATA.

After you hit Enter, *Windows* will generate the error message "The specified path is invalid." Ignore the message, click on OK (or press Tab/Enter), and the group will immediately display your new icon. You get the uninformative message because the path you just entered cannot be found in your PATH environment variable. But if you execute WINWORD from this icon, you'll find yourself in D:\WFW\DATA.

What if you don't have (or don't want) *Word for Windows* in the path? You can still trick the Program Manager into loading a specific file from a specific directory, no matter where WINWORD.EXE is located. In order to do this, you must make sure that the program is associated with the specific kind of file you want. You can change or create extension associations by editing the [extensions] section of WIN.INI or by using the Associate command in the File menu of the File Manager. (Just click on a data file of the type you want to associate; pull down the file menu and select Associate; then fill in the full pathname of the executable in the dialog box.)

Suppose the WINWORD file you want to edit is TODO.DOC.

First, you must associate the .DOC extension with the full pathname of WINWORD.EXE. If you decide to modify WIN.INI, insert the following statement

```
DOC=C:\WINDOWS\WINWORD\WINWORD.EXE
  ^.DOC
```

into the [extensions] section.

Next, create a new program item in the appropriate group. Bring up the group, pull down the Program Manager's File menu, select New, and Enter. Type in a description (such as To Do List) and use D:\WFW\DATA\TODO.DOC as the command.

Press Alt-I to change the icon. This time, type in the full path and filename of WINWORD.EXE and hit Enter. *Windows* will display "The specified path is invalid." Just as before, ignore the message and click on OK (or press Tab/Enter). When you run the newly created program item, *Windows* will change the path to D:\WFW\DATA and "run" TODO.DOC.

Trick the Program Manager into loading a specific file from a specific directory no matter where the executable is located.

DOC is now associated with C:\WINDOWS\WINWORD\WINWORD.EXE, so WINWORD will execute and open TODO.DOC. This technique is especially useful for creating Program Groups of related documents.

Guy J. Gallo
New York, New York

The approach is indeed useful—especially if you have a file that you edit frequently. It also exploits *Windows*' ability (albeit limited) to associate data with a program. It's too bad, however, that we have to work so hard to get the right icon.

There are two other situations where this is useful. If your path contains the program and you enter only the program's name (such as WINWORD.EXE) in the Command Line of the Program Properties Dialog Box, then the program will start in your *Windows* directory. On the other hand, if you specify the full pathname of the executable (C:\WINDOWS\WINWORD\WINWORD.EXE), thats where you will start—in the path C:\WINDOWS\WINWORD. It does not matter whether the program is in the path or not.

MISSING PRINTSCREEN

I have a PS/2 Model 60 with an IBM Proprinter II attached. Before I installed *Windows* 3.0, I used to make use of Shift-PrintScreen. I would, for example, use DIR /P and run the PrintScreen command each time a new page appeared. This way I could print listings of subdirectories or diskette files. Unfortunately, since I installed the latest version of *Windows*, nothing seems to happen when I issue the PrintScreen command. Any ideas?

Vicki Powell
Columbus, Ohio

I assume you mean that you can't print the screen in your usual way from a DOS command shell that you've executed from *Windows* 3.0. If you are running *Windows* in real or standard mode (as you must on the Model 60), then PrintScreen or any of its variations (Shift-PrintScreen, Ctrl-PrintScreen, and so on) simply copies the contents of a text screen to the *Windows* Clipboard. You cannot use it as before to send the screen contents directly to the printer. But, if you return to *Windows* after each page (using Alt-Tab), you can save the screen you just captured to a file via the Clipboard's file menu. Or, paste the information into a program like Notepad or Write. From there, send it to the printer. Note that in real or standard mode, you can't transfer a graphics image to the Clipboard.

Unfortunately, it would be a rather tiresome process to make a long directory listing using the DIR /P command. For each page displayed, you would have to print the screen to the Clipboard, return to *Windows*, use Paste in, say, Notepad (so you can later append the information you've just captured), and then return back to the DOS shell for the next part of the listing. It is much more efficient to simply type DIR > PRN. In this way, you can bypass the return to *Windows* and send the list directly to the printer.

By the way, I should mention that if you use this method with a page printer such as an HP LaserJet, you will need to flush the output by sending a form-feed (Ctrl-L) to the printer. I have a short FLUSH.BAT batch file

```
echo ^L > prn
```

that will do it. To create the file, use a text

editor to insert control characters into the text. Or just use the tried-and-true method

```
copy con flush.bat
echo ^L > prn
^Z
```

If you add the print command to FLUSH.BAT, you can't print several directory listings at once. You can also use FLUSH.BAT for other printing tasks.

In *Windows* 'enhanced mode, the situation is rather different. Now the PrintScreen key has its usual meanings, as long as you are running full screen. Shift-PrintScreen prints the screen and Ctrl-PrintScreen sends output to both the screen and the printer until another Ctrl-PrintScreen is hit. In addition, PrtScr or Alt-PrintScreen will copy the contents of the screen to the Clipboard; you can then paste the result to some other application.

In enhanced mode, you can even use this technique to capture a graphics image. Suppose we run BASIC in a DOS shell. To get into graphics mode type

```
SCREEN 2,0,0,0
```

then draw a circle with the command

```
CIRCLE (200,100),100
```

Now type Alt-PrintScreen to capture the image, return to *Windows* with Alt-Tab, and run Paintbrush. Using the edit command, paste the image into the window.

To discover how to avoid cropping the picture to the visible window area, read the next letter.

MORE ABOUT PRINTSCREEN

In *Windows* you can use Alt-PrintScreen to capture a given window; with PrintScreen you can take a snapshot of the entire desktop. But if the image is too large, Paintbrush crops it to the visible window. I have tried using the View command to eliminate the Tools and the Palette, and I have zoomed Paintbrush to its maximum size: both in vain—I still lose part of the picture. Is there any solution?

Katherine Zvonek
Abilene, Texas

PC MAGAZINE The following procedure can help you. First, copy the screen to the Clipboard using PrintScreen. Next run Paintbrush from the Accessories Group by double-clicking on the Paintbrush icon or using the File menu Run command (Alt-F, R). From the Paintbrush Options menu, choose Image Attributes, select Default and click on OK. From the file menu choose New. From the View menu select Zoom Out. Now using the Edit menu, select Paste. If the image does not appear, perform this last step a second time. Finally, using the View menu, select Zoom In.

To ensure you made the proper capture, use the View menu to View Picture. The image will now appear full-screen. A click of the mouse or a tap of the Esc key will bring you back to normal view.

OPENING WINDOWS

Share your experiences with the *Windows* environment. We'll pay $50 for any tips we print. Mail your contributions on-disk, with a printout, to Windows, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access instructions). ■

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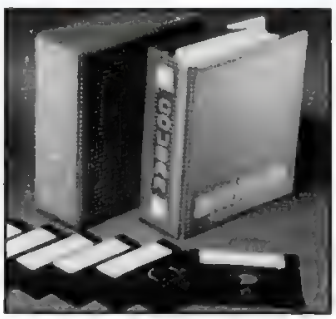

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INTRODUCING

XL

HARDCARD II XL

by Salvatore P. Ricciardi

Databases

■ FOXPRO'S FOR CLAUSE: How to retrieve the FOR clause from one of *FoxPro*'s index files.

FOXPRO'S FOR CLAUSE

FoxPro includes two functions, KEY() and SYS(14), that return the index key expression for an open index file. But there's no function that returns the FOR clause whether the index file is open or not.

However, if you haven't opened the index file, you can get the FOR clause from the index file header using *FoxPro*'s low-level file I/O functions. The following user-defined function is an example:

```
FUNCTION Keyfor
PARAMETERS idxname
PRIVATE handle,forclause
handle = FOPEN(idxname)
=FSEEK(handle,236,0)
forclause =
TRIM(FREAD(handle,220))
=FCLOSE(handle)
RETURN forclause
```

Please note that I did not include any error trapping.

Jeff Winchell
Seattle, Washington

The FOR clause is a useful addition to *FoxPro*'s index management repertoire. With it you can create much smaller indexes, which means you can access data matching the FOR expression faster. After all, the index file only needs to store information pertaining to records that match the condition.

Getting the FOR clause for an existing index file can be useful for a number of things, including automatically producing system documentation or creating a custom data dictionary. The problem is that there's no built-in function to provide this information from a *FoxPro* index file. Mr. Winchell's function applies some knowledge about *FoxPro*'s index file format to retrieve the information directly.

When *FoxPro* creates a conditional index, it stores (among other things) an Index options byte (which specifies some attributes of the index), the KEY expression, and the FOR expression in the index file header. (The index file header is a 512-byte record at the beginning of the index file.) Figure 1 lists the byte offsets of these fields in *FoxPro*'s index file header.

FoxPro's low-level file I/O functions provide byte-by-byte access to this information, or to any file. Using these functions, you can open the index file directly and explore the index file header.

The KeyFor function in Figure 2 is a variation on the one submitted by Mr. Winchell. It reads and returns the FOR clause for a *FoxPro* index file or returns a

A FOXPRO INDEX FILE HEADER

	Starting byte position	Length in bytes
Options byte	14	1
Key expression	16	220
FOR expression	236	220

The possible values for Options byte:
CHR(01)—A unique index
CHR(08)—Index has a FOR clause
CHR(09)—A unique index with a FOR clause.

Figure 1: These fields can be found in *FoxPro*'s index file header.

THE KEYFOR FUNCTION 1 of 2

```
* FUNCTION KeyFor("index filename")
* Return the FOR expression for a FoxPro index file.
*
FUNCTION KeyFor                          && Return FOR clause
PARAMETERS idxname                       && Index filename
PRIVATE handle, forclause
handle = FOPEN(idxname,10)               && Open for read only
IF handle = -1                           && -1 means error
   RETURN ""                             && So set it to null string
ENDIF
= FSEEK(handle,236,0)                    && Goto byte pos 236
forclause = TRIM(FREAD(handle,220))      && Read the FOR clause
IF FERROR() # 0                          && If error occurred
   forclause=""                          && Set it to null string
ENDIF
=FCLOSE(handle)                          && Close the file
forclause = SUBSTR(forclause,1,;         && Remove trailing nulls
          AT(CHR(0),forclause))
RETURN forclause                         && Return result

*
* FUNCTION IsKeyFor("Index Filename")
* Return .T. if FoxPro index has a FOR clause, .F. otherwise.
*
FUNCTION IsKeyFor
PARAMETERS idxname                       && Index filename
PRIVATE handle
handle = FOPEN(idxname,10)               && Open for read only
IF handle = -1                           && -1 means error
   RETURN .F.                            && So set it to FALSE
ENDIF
= FSEEK(handle,14,0)                     && Goto byte pos 14
iopt = FREAD(handle,1)                   && Get index options
IF FERROR() # 0                          && If error occurred
```

Figure 2: These user-defined functions return the FOR clause for a *FoxPro* index file. This can come in handy for automatically producing system documentation, creating a custom data dictionary, and other uses.

THE KEYFOR FUNCTION 2 of 2

```
   =FCLOSE(handle)                     && Close file
   RETURN .F.                          && Return FALSE
ENDIF
=FCLOSE(handle)                        && Close the file
IF (iopt == CHR(8)) .OR. (iopt == CHR(9))
   RETURN .T.                          && 8 or 9 if there
ENDIF                                  && is a FOR clause
RETURN .F.                             && Otherwise .F.

*
* FUNCTION IdxKey("index filename")
* Return the KEY expression for a FoxPro index.
*
FUNCTION IdxKey                        && Return FOR clause
PARAMETERS idxname                     && Index filename
PRIVATE handle, keyclause
handle = FOPEN(idxname,10)             && Open for read only
IF handle == -1                        && -1 means error
   RETURN ""                           && So set it to null
string
ENDIF
= FSEEK(handle,16,0)                   && Goto byte pos 16
keyclause = TRIM(FREAD(handle,220))    && Read the KEY clause
IF FERROR() # 0                        && If error occurred
   keyclause=""                        && Set it to null string
ENDIF
=FCLOSE(handle)                        && Close the file
keyclause = SUBSTR(keyclause,1,;       && Remove trailing nulls
          AT(CHR(0),keyclause))
RETURN keyclause                       && Return result
```

null string, if for some reason an error occurs. In addition to some added error checking, it includes the following line:

```
forclause = SUBSTR(forclause,1,;
          AT(CHR(0),forclause))
```

When the `forclause` variable is set using the FREAD function, a full 220 bytes are returned from the file, as we requested. It'll consist of the actual FOR expression right-padded with nulls, since *FoxPro* pads the field in the file header with binary zeros. The line above removes the trailing nulls from the `forclause` variable.

If the KeyFor function returns a null value, either an error occurred while trying to access the index file or the file header actually contains a null value in the FOR expression field. To check for an error, use *FoxPro*'s FERROR() function. This returns an error code or zero, depending on whether or not an error occurred.

Two additional functions are included in Figure 2. The IsKeyFor function can be used to find out whether or not a *FoxPro* index file contains a FOR clause. It examines the Index options byte in the index file header and returns .T. if the index contains

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CIRCLE 158 ON READER SERVICE CARD

FOXIDX.PRG — **COMPLETE LISTING**

```
* FOXIDX.PRG
* Display some information for all .IDX files
* in the current directory
*
PROCEDURE FoxIdx
PRIVATE filespec, idxname
filespec = "*.IDX"                      && Change to ".NDX" if
                                        && INDEX=NDX in CONFIG.FP
idxname = SYS(2000, filespec)           && Find first matching file
DO WHILE ! EMPTY(idxname)               && For each match
   DO PrintInfo WITH idxname            && Print some info
   idxname = SYS(2000, filespec, 1)     && Find next matching
ENDDO

RETURN

* PROCEDURE PrintInfo
* Print some info for the FoxPro index file whose
* name was passed as a parameter
*
PROCEDURE PrintInfo                     && Print some info
PARAMETERS iname                        && Name of idx file
PRIVATE ikey, ifor
?
? "Filename:   "+iname
ikey = IdxKey(iname)                    && Get index key
IF ("" == ikey)                         && If it is null
   IF FERROR() # 0                      && Check for error
      ikey = "Error: "+FerrorTxt(ferror())
   ENDIF
ENDIF

? "Key:        "+ikey

IF IsKeyFor(iname)                      && If index has FOR clause
   ifor = KeyFor(iname)                 && Get it
   IF ("" == ifor)                      && If it is null
      IF FERROR() # 0                   && Check for error
         ifor = "Error: "+FerrorTxt(ferror())
      ENDIF
   ENDIF
   ? "FOR clause: "+ifor
ELSE                                    && No FOR clause
   IF FERROR() # 0                      && Check for error
      ifor = "Error: "+FerrorTxt(ferror())
      ? "FOR clause: "+ifor
   ELSE
      ? "FOR clause: "+""none""
   ENDIF
ENDIF
RETURN

* FUNCTION FerrorTxt(error number from FERROR())
* Return the text for the associated error number
* returned from FERROR()
*
FUNCTION FerrorTxt
PARAMETER errno
DO CASE
 CASE errno = 2
   RETURN "File not found"
 CASE errno = 4
   RETURN "Too many files open (insufficient handles)"
 CASE errno = 5
   RETURN "Access denied"
 CASE errno = 6
   RETURN "Invalid file handle"
 CASE errno = 8
   RETURN "Out of memory"
 CASE errno = 25
   RETURN "Seek past beginning of file"
 CASE errno = 29
   RETURN "Disk full"
 CASE errno = 31
   RETURN "Error opening file, or EOF encountered"
 OTHERWISE
   RETURN "Unknown error"
ENDCASE
RETURN
```

Figure 3: This program uses the user-defined functions in Figure 2 to display some information for all *FoxPro* .IDX files in the current directory.

SAMPLE OUTPUT FROM FOXIDX.PRG

```
Filename:   CLIENT_I.IDX
Key:        client_id
FOR clause: "none"

Filename:   PROINST.IDX
Key:        STR(DISKNO,2)
FOR clause: "none"

Filename:   TEMP.IDX
Key:        CLIENT_ID
FOR clause: CLIENT_ID>"B"

Filename:   FOXUSER.IDX
Key:        Error: Access denied
FOR clause: Error: Access denied
```

Figure 4: Sample output from the FOXIDX.PRG program in Figure 3. The last request is denied, since the user is already using FOXUSER.IDX.

a FOR clause; otherwise, it returns .F. It also returns .F. if an error has occurred.

The Index options byte currently specifies either a CHR(8) or CHR(9) if the index has a FOR clause.

The IdxKey function returns the key expression for a given *FoxPro* index file. Like its IsKeyFor cousin above, it will return a null string if an error occurs. *FoxPro* also supplies the KEY() and SYS(14) functions to return the KEY expression for a given index file, but they require that the index file already be open. IdxKey has no such requirement. Be aware that all of the information in Figure 1 is subject to change in new releases of *FoxPro*.

A sample program that uses these functions is shown in Figure 3. This program will display the KEY and FOR expressions for all *FoxPro* .IDX files it finds in the current directory. A sample of the output produced by FOXIDX is shown in Figure 4. The FerrorTxt function in Figure 3 may also be useful for programming in *FoxPro*. It returns an error description for each error code returned by *FoxPro*'s FERROR() function. You might use it like this:

```
? FerrorTxt(FERROR())
```

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Salvatore P. Ricciardi, a New York based consultant, is a frequent contributor to PC Magazine.

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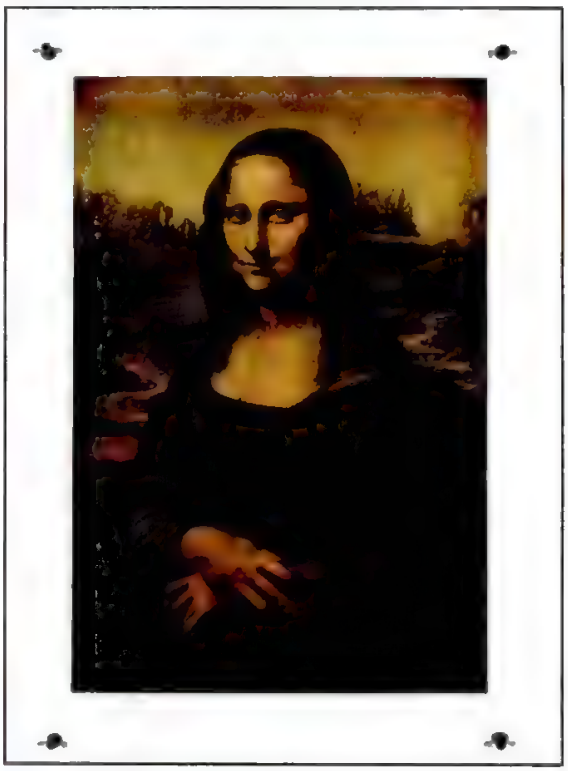

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by
Craig Stinson

Spreadsheets

AUTOMATE FILE OPEN

I think *Microsoft Excel* is the best all-around spreadsheet for the PC environment, but it has a few inadequacies.

One of these involves the way you start *Excel* under *Windows* 3.0. With the *Windows* Program Manager, everything is now a nifty icon. But if you want to open *Excel* with a specific spreadsheet, the Program Manager is not very convenient. You have three choices: load *Excel*, close Sheet1, and then open the file you want; create many *Excel* icons, each linked to a particular spreadsheet; or run File Manager and double-click the name of the spreadsheet you want to start *Excel* with.

None of these choices provides simplicity and flexibility. My solution is the Auto_Open macro shown in Figure 1. This macro includes two simple functions: **=OPEN?()** and **NEW(1)**. The OPEN function presents the File Open dialog box. If you choose to open a file, the macro stops right there. If you don't want to open a file, click Cancel or press Esc: The dialog box goes away and the NEW statement opens a blank worksheet named Sheet1.

I have used the Program Manager's Properties command to associate EXCEL.EXE with this macro sheet. Now every time I double-click my *Excel* icon, I start up with this Auto_Open macro.

Michael Tang
San Jose, California

PC MAGAZINE Mr. Tang's Auto_Open macro clearly falls into the "Why didn't I think of this one" category. If you want to go right to work on a particular spreadsheet, the macro spares you the trouble of closing Sheet1. And if you want to work with a brand-new sheet, all you have to do is click Cancel or press Esc. For good measure, the macro hides itself, so you don't have to be bothered looking at it.

If you're running *Excel* under *Windows*, Version 2, you won't be able to link Mr. Tang's macro sheet with a Program Manager icon. But you can still arrange to have *Excel* start every time with the macro.

If you're using the runtime version of *Windows*, simply start *Excel* by typing

```
EXCEL TANG.XLM
```

(Of course, you should substitute the name of your own macro sheet if you don't use TANG.XLM.)

If you're using the full version of *Windows* 2, make a backup copy of your WIN.INI file (just in case you inadvertently damage this essential file). Then use a plain text editor to open WIN.INI. Search for the heading [Microsoft Excel]. Under that heading, add the following line:

```
Open=C:\EXCEL\TANG.XLM
```

(Substitute the correct path and name of your macro sheet.)

Then be sure to save the file. When you start *Excel* at your next *Windows* session, the macro sheet should be loaded automatically.

FILEOPEN.XLM

```
     A
1  Auto_Open
2  =HIDE()
3  =OPEN?()
4  =IF(A3=TRUE,GOTO(A6))
5  =NEW(1)
6  =RETURN()
```

Figure 1: Start *Excel* with any spreadsheet while in *Windows* 3.0, using this macro.

- AUTOMATE FILE OPEN: Save several steps when you execute *Excel*.
- TRACK SPREADSHEET REVISIONS: Use this *1-2-3* macro to assign a consecutive number, the date, and comments to each version of a worksheet.
- NO MORE SERIAL DATES: Enter dates as text strings and let a *1-2-3* macro worry about converting them to serial values.

TRACK SPREADSHEET REVISIONS

I often prepare budgets, projections, and reports that undergo many revisions before I issue the final version. It is essential to identify each revision and to track the changes incorporated. But the process is a hassle, so I wrote the macro listed in Figure 2 to simplify identification and documentation.

The macro assigns a sequential number to each subsequent version of a spreadsheet. It then writes the revision number and date to a footer. The footer will appear on each page of the spreadsheet when you print it.

The macro also prompts you for documentation comments, which along with the revision number and date, are written to a separate ASCII disk file. You can print the file with any word processor or load it back into *1-2-3* with the /File Import command.

The main body of the macro lies in range A1..B12. The {LET} command in A3 increments the revision number each time you invoke the macro and deposits the result in REVISION_NBR (A1). The {CONTENTS} command converts the date (generated in A1) and the revision number to formatted strings. This conversion is necessary, because *1-2-3* accepts only strings in footers.

The instructions in B7 through B11 create the actual footer. The Z{ESC} erases any footer that may have been in effect before the macro was called.

The commands booted in cell B12 return the spreadsheet to READY mode. If you want the macro to print the spreadsheet after creating the footer, you need to change line 12 to

```
~QAGPQ
```

The FILE_WRITE subroutine in A6 prompts you to enter your documentation and then writes the data to disk. If you do not need this disk record, you should delete lines A6 and A14..B30; you'll still be able to use the macro to produce revision-identification footers.

The FILE_WRITE subroutine begins in B16 by checking to see whether you've assigned a name to the documentation file. The name is stored in B14. If that cell is blank, the macro branches to B19 and prompts you for a filename. Line 20 then opens a new disk file with the supplied filename.

If B14 is not blank, the macro opens the existing file, prompts you for the new documentation comments, and stores those comments in B15. The instruction in B22 then writes everything—the revision number, date, and documentation comments—to the file and ends the line with a carriage return and line-feed. Note that the file is opened in *append* mode. This means that the new comments will be added at the end of the existing file.

TRAKLOG2.WK1 COMPLETE LISTING

```
     A              B
1    DATE_VALUE     @NOW
2    REVISION_NBR
3    \R             {LET REVISION_NBR,REVISION_NBR+1}
4                   {CONTENTS REVISION_STR,REVISION_NBR,3,0}
5                   {CONTENTS DATE_STRING,DATE_VALUE,10,114}
6                   {FILE_WRITE}
7                   /PPOFF(ESC)REVISION
8    REVISION_STR
9                   |LAST REVISED
10   DATE_STRING
11                  |DATE PRINTED @
12                  ~QQ
13
14   FILE_NAME      newfile
15   LOG_TEXT
16   FILE_WRITE     {IF @CELL("TYPE",FILE_NAME)="B"}{BRANCH NEW_FILE}
17                  {OPEN FILE_NAME,A}{BRANCH FILE_ERROR}
18                  {BRANCH AGAIN}
19   NEW_FILE       {GETLABEL "ENTER LOG FILE NAME - ",FILE_NAME}
20                  {OPEN FILE_NAME,W}{BRANCH FILE_ERROR}
21   AGAIN          {GETLABEL "COMMENTS ",LOG_TEXT}
22                  {WRITELN REVISION_STR&DATE_STRING&LOG_TEXT}
23                  {GETLABEL "ENTER Y TO ADD MORE COMMENTS LINES ",LOG_TEXT}
24                  {IF LOG_TEXT="Y"}{BRANCH AGAIN}
25                  {CLOSE FILE_NAME}
26                  {RETURN}
27
28   FILE_ERROR     {BEEP}
29                  {GETLABEL "COULD NOT OPEN DISK FILE",LOG_TEXT}
30                  {BRANCH NEW_FILE}
31
32   \N             {GETNUMBER "Set revision number to: ",REVISION_NBR}
33                  {LET REVISION_NBR,REVISION_NBR-1}
34                  {GETLABEL "Start a new log file? (Y/N) ",ANS}
35                  {IF @UPPER(ANS)="Y"}{BLANK FILE_NAME}
36                  {\R}
37
38   ANS
```

Figure 3: This tracking macro enhances its precursor in Figure 2. The new macro lets you reset the revision number and clear the log file using macro-driven prompts.

The instructions in B23 and B24 let you press Y to add more comment lines for each revision. This loop continues as long as you have more information to record. Pressing anything other than Y breaks the loop, closes the file, and returns control to the main macro.

If any of the file operations fail (for example, because you specify a drive that isn't ready or try to append comments to a file that doesn't exist), an error-trapping routine at B28 is invoked. FILE_ERROR issues a beep, notifies you that the file can not be opened, and returns the macro to B19. There, it will prompt you for a valid filename.

I usually give the documentation file the same name as the spreadsheet file, using the extension .LOG instead of .WK1. This practice makes it easy to find the documentation when I need it.

John Peace
Vernon, Connecticut

This macro is an excellent way to maintain an audit trail on the development of important *1-2-3* documents. The log file can keep a record of the dates on which changes were made,

TRAKLOG.WK1 COMPLETE LISTING

```
     A              B              C        D        E        F
1    DATE_VALUE     @NOW
2    REVISION_NBR
3    \R             {LET REVISION_NBR,REVISION_NBR+1}
4                   {CONTENTS REVISION_STR,REVISION_NBR,3,0}
5                   {CONTENTS DATE_STRING,DATE_VALUE,10,114}
6                   {FILE_WRITE}
7                   /PPOFF(ESC)REVISION
8    REVISION_STR   ***
9                   |LAST REVISED
10   DATE_STRING
11                  |DATE PRINTED @
12                  ~QQ
13
14   FILE_NAME
15   LOG_TEXT
16   FILE_WRITE     {IF @CELL("TYPE",FILE_NAME)="B"}{BRANCH NEW_FILE}
17                  {OPEN FILE_NAME,A}{BRANCH FILE_ERROR}
18                  {BRANCH AGAIN}
19   NEW_FILE       {GETLABEL "ENTER LOG FILE NAME - ",FILE_NAME}
20                  {OPEN FILE_NAME,W}{BRANCH FILE_ERROR}
21   AGAIN          {GETLABEL "COMMENTS ",LOG_TEXT}
22                  {WRITELN REVISION_STR&DATE_STRING&LOG_TEXT}
23                  {GETLABEL "ENTER Y TO ADD MORE COMMENTS LINES ",LOG_TEXT}
24                  {IF LOG_TEXT="Y"}{BRANCH AGAIN}
25                  {CLOSE FILE_NAME}
26                  {RETURN}
27
28   FILE_ERROR     {BEEP}
29                  {GETLABEL "COULD NOT OPEN DISK FILE",LOG_TEXT}
30                  {BRANCH NEW_FILE}
```

Figure 2: This macro assigns a version number and the current date to each worksheet revision. An optional subroutine lets you incorporate comments that it writes to a text file.

the reasons they were made, and so on. When your document reaches its final form, you can use /File Import to merge the log file into the worksheet itself for permanent safekeeping.

To use the macro with a new worksheet, first choose /File Combine Copy to bring the macro into a blank area of the worksheet. Use /Range Name Labels Right to create cell names based on the labels in the macro's first column. Finally, set the cell named REVISION_NBR to one fewer than the first revision number you want to use. For example, if you want your first version number to be 1, set REVISION_NBR to 0. If you want it to be 0, set REVISION_NBR to –1. If you want to create a new log file, use /Range Erase to blank the cell named FILE_NAME.

If you want to automate the process of resetting the revision number and clearing the log-file name, use the macro shown in Figure 3. This macro adds some code to the end of Mr. Peace's macro. Simply press Alt-N, instead of Alt-R, to run the macro for the first time on a new worksheet. The additional code will prompt you for a starting revision number and then ask whether you want to open a new log file. Be sure to supply the first revision number you actually plan to use (not one fewer than that number), since the \N routine will do the subtraction for you.

As shown in Figure 2, Mr. Peace's macro can accommodate revision numbers up to 99. If you want to use three-digit numbers, change the argument 3 to a 4 in A3's {CONTENTS} command and add a space character at the end of line 7.

NO MORE SERIAL DATES

Many *Lotus 1-2-3* users find it monotonous to enter the date by typing @DATE; some may not even be aware that dates entered as text cannot be used in calculations. To solve both problems, I run the macro shown in Figure 4.

After it prompts you for a text-string date in the form MM/DD/YY, the macro uses @DATEVALUE to convert the string to a serial value. It then copies the value to the current cell (wherever that may be) and finally assigns the D1 (DD-MMM-YY) format to the entry.

Robert Abuhoff
New York, New York

DATE.WK1 COMPLETE LISTING

```
\D      {GetLabel "Enter Date (MM/DD/YR): ",TDATE}
        {let NDATE,@datevalue(TDATE)}
        /cNDATE~~
        /rfd1~

TDATE
NDATE
```

Figure 4: Press Alt-D and type a text string date at the prompt. The macro will convert the string into a serial date value that you can use in formulas. The date will be displayed in DD-MMM-YY format.

DATE2.WK1 COMPLETE LISTING

```
\D      {GetLabel "Enter Date (MM/DD/YR): ",TDATE}
        {if @iserr(@datevalue(TDATE))}{beep}{branch \D}
        {let NDATE,@datevalue(TDATE)}
        {if @cellpointer("width")<10}/wcs10~
        /cNDATE~~
        /rfd1~

TDATE
NDATE
```

Figure 5: The macro above expands on the one in Figure 4. It provides error-trapping formulas that prevent you from entering the date incorrectly or depositing the converted date into a cell that is too narrow.

People who use the Borland spreadsheet programs—from the very first version of *Quattro* on down the line—have enjoyed the convenience of being able to enter dates as ordinary text strings. These users have simply to type Ctrl-D, followed by the string. The software immediately converts the string into an appropriately formatted serial date value—one that can be used in arithmetic formulas.

Mr. Abuhoff's macro brings the same convenience to the Lotus world. As long as you have this macro in your library, you can forget about @DATE—at least when it comes to entering dates on the worksheet. Just type Alt-D and respond to the prompt that's displayed. The macro asks for a string in the form MM/DD/YY, but you can actually enter a text string that resembles any of *1-2-3*'s five date formats (with or without trailing zeros for single-digit months and days). To enter the first day of 1991, for example, your text string could look like any of the following formats: 01-Jan-91, 1-Jan-91, 01-jan-91, 1-jan-91, 01-Jan, 01-jan, Jan-91, jan-91, 1/1/91, 01/1/91, 1/01/91, 01/01/91, 1/1, 1/01, 01/1, or 01/01.

No matter how you type in a date string, the macro will always assign the Long International format to the entry. By default, that format is DD-MMM-YY. If you like your dates displayed in a different format, you can change the last line of the macro from **/rfd1~** to **/rfd2~**, **/rfd3~**, **/rfd4~**, or **/rfd5~**.

First, the macro offers no way to deal with entry errors. This is easily addressed: Simply use {IF} in conjunction with @ISERR to determine whether an invalid date string has been entered, and then branch back to the first line of the macro for a retry. You could add the error trap between the first and second lines.

Second, if the cell width is less than 10, a date in DD-MMM-YY format will be displayed as a disconcerting row of asterisks. At some point in the macro—it doesn't matter where—you might want to determine whether the current cell is wide enough to accommodate the date you need to enter. Use @CELLPOINTER("width") to do the checking. If you discover that the cell is too narrow, your macro can change the cell width to 10. Figure 5 shows how this expanded macro might look.

HINTS, TIPS, QUESTIONS

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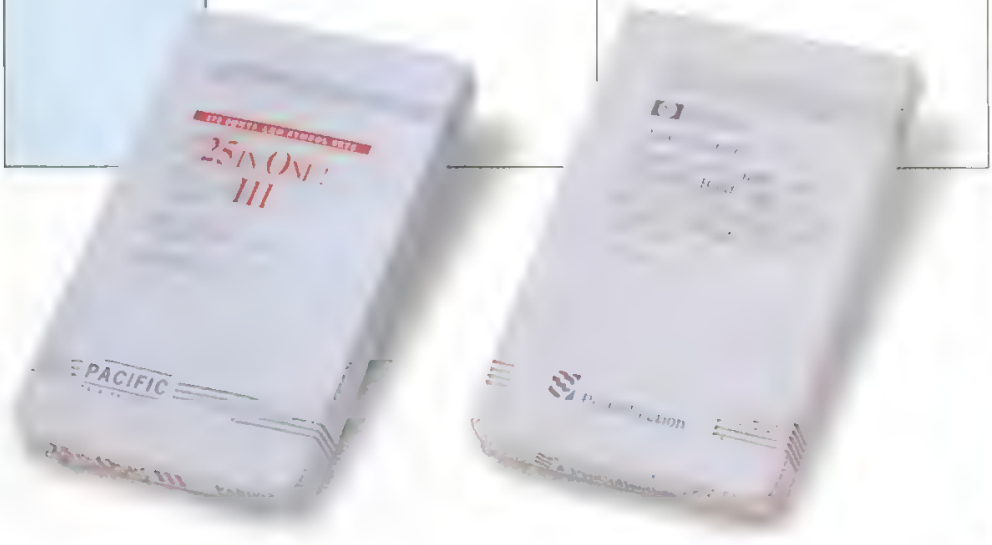

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by
Costa Rodis

The Working Word

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 /E
```

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```
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COPY C:\WP51\WP.FIL   D:\WP51
COPY C:\WP51\WP{WP}.SET   D:\WP51
PATH D:\WP51
```

to your AUTOEXEC.BAT.

The new CONFIG.SYS line defines 1MB of extended memory as a virtual disk. Assuming that the C: drive is your boot disk and that the D: drive is the virtual disk, the commands in the AUTOEXEC.BAT create a *WordPerfect* subdirectory on the D: drive, copy the three files listed as *WordPerfect* files to this subdirectory, and define a path for the subdirectory. These three and other temporary overlay files together occupy about 810K of extended memory.

Once you set up CONFIG.SYS and AUTOEXEC.BAT, reboot your PC, and run *WordPerfect*, you'll immediately notice that its start-up is much faster. Note that you do have to be particularly careful when you use Setup (Shift-F1). If you want to change the setup parameters permanently, you have to start *WordPerfect* from its subdirectory on C:. Otherwise, the setup changes that you make will be effective only until you shut off your machine. This is because the changes are reflected in WP{WP}.SET in the virtual disk, which will be refreshed each time you turn on your computer.

Yuzuru Suzuki
Malden, Massachusetts

- FASTER ACCESS IN WORDPERFECT: Although the manual denies it, you can make use of extended memory to speed up the program.
- PHONE DIALING: Use a *WordPerfect* macro—instead of your fingers—to dial a number.

If you work on any DOS-compatible computer other than an 80386 or an 80486, *WordPerfect*—and just about any other program—does work much faster when you access it from RAM rather than from disk.

When using Suzuki's method, keep in mind that unless you indicate otherwise in Setup (Shift-F1, L), *WordPerfect* will save your files and timed backups to the current directory, which at this point is the virtual disk. Thus, if you don't take precautions, these files will disappear as soon as you turn off your PC. These days, you can make most word processing programs automatically save your files to a specific directory, but there are some programs that cannot. If you run such a program (or for that matter any version of *WordPerfect* below 5.1) and want to use extended memory, start your application from your files directory. For example, if your files are located in C:\WPFILES, change to that directory and then type D:\WP50\WP. *WordPerfect* quickly loads, and it will automatically save files to C:\WPFILES.

For those of you who are wondering what a files directory is, let's talk briefly about disk organization. During the installation of most word processing programs, you typically have the opportunity to choose where the program and its document files will be saved. But most people just follow the default settings provided by the software, which usually places everything in one directory. This is how *WordPerfect* operates. But sifting through 100 or so program files to find your own documents gets tedious mighty fast. And if one day you decide to delete old files or move them onto floppy disks, there is a good chance you'll accidently delete a program file.

What's the best way to avoid this problem—and get a performance increase from your hard disk to boot? Use a separate directory for your documents. I have *WordPerfect* configured to save files to a directory named C:\WPFILES. The result is a significantly faster file listing of nothing but what *I* have written. Similarly, I save my *Word* documents to C:\WORDDOCS, *MultiMate* documents to C:\MMFILES, *Word for Windows* files to C:\WWFILES, and so on. In fact, I use this method for *all* my programs, since it simplifies backups as well.

PHONE DIALING

There are a number of memory-resident utility programs that can pick a number off the screen and dial it on your phone via the computer's modem. The macro shown in Figure 1 lets you do the same task from within a *WordPerfect* document.

In order to use the macro, your printer must be set up to address the communications port used by your modem. To do this, Press Shift-F7 to bring up the print menu, S to select a printer, A for additional printers, and then choose "DOS Text Printer" from the list of dot matrix printers.

WordPerfect will then present the "Printer Select Edit" screen, which allows you to configure a printer. To start, select option 1 and change the printer name so that it starts with the number 0. The new printer will move to the top of the list. This way it will be easy for your macro to select the printer. You must also change the Port (option 2) to either COM1 or COM2—whichever one your modem uses. You'll

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The Working Word

then be prompted to add the communications parameters. I use 300 bps, 7 character bits, 1 stop bit, and even parity—although other settings should work just as well. Once the settings are adjusted, press the exit key (F7) to return to the previous menu.

Now you will need to change the name of your default printer so that it moves to the end of the list. In order to do this, simply insert the letter Z before the name. For example, my printer list starts with **0 dial com2** and ends with **Z Standard Printer**.

Once you are set up, you can go ahead and use the macro. In your document, place the cursor on a number that you want to dial and call up the macro. Note that the phone number cannot contain any blanks, but it is acceptable for it to contain hyphens and parentheses.

The macro will change printers to the new entry. It will then copy the phone number to the end of your document and precede it with the dial command used by Hayes-compatible modems. The copied line will be sent to the printer using the Block Print command. It may be a few seconds before you hear the modem dial, so you will have to be patient.

The macro will pause until you press enter. At that point, it will disconnect the modem and reset the printer default to the choice located at the bottom of the printer list.

Although the macro is not as powerful or fast as many telephone utility programs, it should meet the needs of many users. In addition, it can be combined with the *WordPerfect* Search and Sort commands to create a simple line-format telephone directory.

Robert F. Mouradian
Cincinnati, Ohio

On occasion we receive tips from readers that make us do a double take. After reading Mr. Mouradian's suggestion, I stared at the printer setup screen of *WordPerfect*, wondering why I hadn't thought of the idea.

I've altered Mr. Mouradian's macro to eliminate the step of renaming printers and to cut down on unnecessary cursor movements (such as copying the phone number to the end of the document). Creating a new printer definition for the modem is the only step one need take other than defining a macro. Mr. Mouradian could have used *WordPerfect*'s native macro programming language to define the printer, but his own method keeps the process simple and intuitive.

DIALIT.WPM — **COMPLETE LISTING**

```
{DISPLAY OFF}                                {;} Turn off display~
{Print}snMODEM{Enter}s{Enter}                {;} Select modem printer name~
{Word Right}{Left}"                          {;} add closing quote after number~
{Word Left}"+++""ATDT"                       {;} Insert Hayes dial command before number~
{Word Left}{Word Left}                       {;} Place cursor at beginning of number~
{Block}{Word Right}{Right}
{Search}"{Search}{Print}y                    {;} Print number and Hayes command to modem~
{Backspace}                                  {;} Delete end quote~
{Word Left}{Word Left}                       {;} Place cursor at beginning of Hayes command~
{Block}{Search}ATDT{Search}{Del}y            {;} Delete Hayes command~
{DISPLAY ON}                                 {;} Turn on display~
{PROMPT}Press ENTER to disconnect modem~
{PAUSE}                                      {;} Display instructions and wait~
{DISPLAY OFF}                                {;} Turn off display~
"+++""ATH"                                   {;} Type Hayes command to disconnect modem~
{Block}{Search Left}"+{Search}
{Left}{Left}                                 {;} Block disconnect command~
{Print}y                                     {;} Print command to modem~
{Block}{Search}H"{Search}
{Del}y                                       {;} Block/delete disconnect command~
{Print}snHP LaserJet III{Enter}s{Enter}      {;} Select normal default printer~
```

Figure 1: Put your cursor on the phone number you want, run this macro, and the macro will dial the number on your phone.

TIPS FROM WORKING WORDSMITHS

Tell fellow users about your latest word processing tips, and we'll pay you $50 for any tips we print. Please send your letter on a disk along with a printout. Mail your contributions to The Working Word, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access instructions). ■

Costa Rodis is a computer consultant in New York City.

by
Neil J. Rubenking

User-to-User

CHANGING DOS COMMANDS

I'm using a DOS shell that supports a mouse. So when I wish to execute a program, I double-click on the program name in the file listing. Many times I'd like to clear the screen after running some program. Of course, I could enter CLS from the keyboard to get the job done, but I would like to do it with the mouse.

When DOS gets a command to execute, it first checks in its list of internal commands. If it doesn't find the command there, it then searches for a file of that name with a .COM, .EXE, or .BAT extension, in that order. With this in mind, I created an empty file called CLS.COM using REM > CLS.COM. When I double-click on CLS.COM, DOS executes its own internal CLS command. CLS.COM is never executed—it's used here only to pass the name CLS to the DOS shell. It could have been CLS.EXE, or CLS.BAT, as well. Best of all, an empty file occupies only an entry in the directory and doesn't use up any additional disk space.

Lee Swee Kee
Johor, Malaysia

- **CHANGING DOS COMMANDS:** This clever trick lets you mouse-click on DOS commands that don't exist as external programs.
- **STACKING COMMANDS:** This batch file runs several commands at once from the DOS command line.
- **BLANK LINES IN BATCH FILES:** The definitive word on using ECHO to write blank lines in your batch files.

PC MAGAZINE Of course you could do the same with any internal DOS command. Create a 0-byte .COM file with the same name and it will appear on your mouse menu. Don't forget the command-name order of precedence mentioned above. Internal commands come first, followed by .COM, .EXE, and .BAT. For example, if you have GO.COM, GO.EXE, and GO.BAT available, typing GO will always run GO.COM. Even if you spell out the extension and type GO .BAT or GO.EXE, DOS still runs the .COM file.

There *is* a way to create programs with the same name as DOS internal commands, but it involves patching COMMAND.COM. You must load a copy of COMMAND.COM into DEBUG and locate the name of the command you're interested in. For example, if you want to replace the CHDIR command, type the following line into DEBUG:

```
S CS:100 FFFF 'CHDIR'
```

DEBUG will report one or more addresses. Use the D command followed by the address where you want to dump the file—the correct address will be in the middle of a list of all the DOS internal commands. Replace the command name with lowercase letters, write the changed file, and quit.

Now you can install your own CHDIR .EXE program—perhaps it's a security-conscious version that requires a password before it will switch to certain directories. Whether you type `chdir`, `ChDir`, or any combination of upper- and lowercase, DOS uppercases your input to `CHDIR`. But DOS searches its command table in a case-sensitive way, so the new `chdir` entry in the table doesn't match. Since DOS won't find a CHDIR internal command, it will execute your CHDIR.EXE program.

STACKING COMMANDS

DOS doesn't let you enter more than one command at a time. But STACK.BAT (Figure 1) parses the command line into subcommands and executes each one. It uses the exclamation point (!) as the delimiter. Now, for example, you can enter a line like the following

```
STACK DIR *.BAT ! CHKDSK ! ECHO
 The job is done.
```

and STACK will take care of each command, one at a time.

Al Drillick
Brooklyn, New York

PC MAGAZINE STACK.BAT does about the same thing as the RUN.C program published in the Languages column of the September 12, 1989, issue. RUN.C uses the semicolon as a delimiter, and STACK uses an exclamation mark. Unlike RUN.C, STACK.BAT requires its delimiter to be separated from the commands by a space on either side. Note that with either program, you can't use redirection symbols in the command list.

The main loop in STACK.BAT processes each command-line parameter in turn using the SHIFT statement. Each SHIFT moves the second parameter to the first, the third to the second, and so on. A batch program can process every parameter by SHIFTing each one into the number-one slot.

STACK.BAT builds subcommands in the environment variable `stack_arg`. At the start, it clears this variable. Then as the loop processes each command-line parameter, it adds that parameter to `stack_arg`. If the parameter is an exclamation mark, it executes the subcommand and clears `stack_arg` for the next round. When the first parameter comes up empty, the batch file has used up all of the command-line parameters. Then, all that's left to do is execute the final subcommand and clear the environment variable.

STACK.BAT may not run as fast as RUN.EXE, compiled from RUN.C. But in terms of disk space, STACK.BAT is less than a cluster and RUN.EXE is 12K. I

STACK.BAT — **COMPLETE LISTING**

```
@ECHO OFF
REM The environment variable stack_arg holds the subcommand
SET stack_arg=

:loop
REM If we reached a delimiter, execute the subcommand
IF '%1'==''' GOTO execute

REM Keep building the subcommand
SET stack_arg=%stack_arg% %1
GOTO shift

:execute
REM Call the subcommand we've built
CALL %stack_arg%
REM Clear for the next subcommand
SET stack_arg=

:shift
SHIFT
REM If there are more commands, loop through again
IF NOT '%1'=='' GOTO :loop
REM Otherwise execute the last subcommand
CALL %stack_arg%
SET stack_arg=
```

Figure 1: This routine parses the command line into subcommands and then executes each one, allowing you to stack up any number of commands—it's like an instant batch file.

think most people would agree that's a fair trade of speed for size!

BLANK LINES IN BATCH FILES

The first book I read on DOS showed how to use DOS's ECHO command to write blank lines to standard output. This gave me the ability to use blank lines to beautify batch file screen and printer output. Thus armed, I used blank lines liberally to improve readability of text and instructions displayed by my batch files.

The undocumented trick I learned worked with DOS 3.0 and earlier. You enter a line consisting of the ECHO command followed by two spaces and a carriage return into a batch file or at the DOS prompt, causing DOS to echo a space and carriage return to standard output. This, of course, looks just like a blank line.

When I upgraded to DOS 3.1, I discovered that this trick no longer worked. That's the trouble with using undocumented DOS features. Versions of DOS after 3.0 strip trailing spaces from the statement, leaving only the ECHO command. As a consequence, all my formerly blank lines just reported "ECHO is off," which is much worse than no blank line at all!

As a ploy to force DOS to implement the spacing I wanted, I substituted the statement ECHO. and accepted the single period at the beginning of otherwise blank lines as a necessary evil.

Suddenly, one of my edited batch file screens showed the elusive blank line, a line that should have started with a period, but didn't. Checking the batch file, I discovered I'd accidentally left the space out of the statement, which then read ECHO.. Apparently, COMMAND.COM will accept a period immediately after ECHO to force a blank line to standard output. This undocumented trick works in DOS, Versions 3.1 through 3.3. The characters \+":/ can also be used to work this miracle.

There isn't one syntax that will echo blank lines to standard output for *all* DOS versions, but the Alt-255 method works under *most* of them.

While there isn't a single syntax that will echo blank lines to standard output for all versions of DOS, one of these undocumented DOS tricks will work with any version 2.*x* or 3.*x*.

John M. Ferens
Seattle, Washington

I get a remarkable number of tiny submissions regarding how to echo blank lines in a batch file. The item above omits the most common method, which is to follow ECHO with a space and ASCII character 255. To create this character, hold down the Alt key, tap out 2 5 5 on the numeric keypad, and then release the Alt key. The ASCII 255 character displays and prints as a space, but in actuality it is *not* a space, so DOS doesn't strip it off. Another possible method is to ECHO an ANSI command that doesn't have any effect on the screen, such as the Save Cursor Position command.

Like the author of this item, I believed that no one approach would work for all DOS versions. However, in testing several methods with each DOS version from 2.0 through 4.0, I found that the Alt-255 method works under *every one* of them. For DOS 3.0 and earlier, ECHO followed by two spaces works, but ECHO followed immediately by a period doesn't. For DOS 3.1 and later, I found the reverse. Actually, ECHO followed by any of the characters +."/\:[] will echo a blank line in DOS 3.1 and up.

Echoing the ANSI Save Cursor Position command, which doesn't affect the screen, also works in any DOS version, provided ANSI is loaded. But why not use ANSI commands that *do* affect the screen? The whole point of ECHOing blank lines is to format screen output nicely, and with ANSI cursor-positioning and color-changing commands, you can make *truly* attractive screens. But that's a whole different story. . . .

SHARE YOUR SECRETS

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by
Jeff Prosise

Tutor

CHECKING UNDER THE HOOD

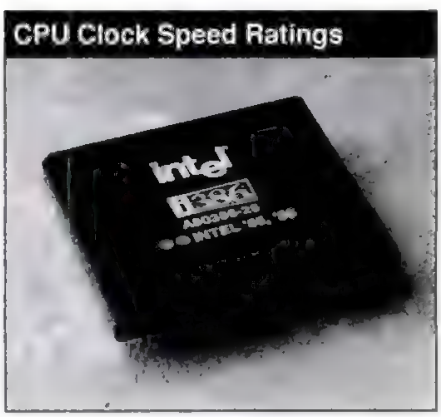
I recently purchased a 25-MHz 386 PC. When I took the cover off, I discovered that the CPU was rated for only 20 MHz. I called the manufacturer, who told me that the temperature range the chip is rated for is too conservative and that it should run fine at 25 MHz. What's the real story here? Should I demand my money back?

Kim Gardner
St. Louis, Missouri

PC MAGAZINE You should indeed get your money back. After a 386 is manufactured, Intel submits it to a rigorous series of tests (the exact nature of which is proprietary, so Intel won't disclose what the tests involve) that determines the chip's clock-speed rating—the maximum clock speed at which it should be run. The point to note here is that a CPU rated for 20 MHz *failed* a test at 25 MHz somewhere along the line. That's ample reason not to use it in a 25-MHz system.

It's probably true that Intel's tests are highly conservative. It's also true that you may run that CPU at 25 MHz for years and never encounter the glitch that Intel did. Still, the practice of running CPUs at higher-than-rated speeds is one that Intel strongly condemns. Ironically, the integrator who put your PC together probably didn't save that much money by using a slower chip. Right now, 16-, 20-, and 25-MHz 80386DXs all cost the same from Intel: $177 each in quantities of 1,000. Six months ago, the price of 20- and 25-MHz 386s differed by only $5—hardly enough to make a difference on a box with a $2,000-plus price tag.

You can tell what speed a 386 or other Intel chip is rated for by looking at the label on the top, as shown in Figure 1. A chip labeled 80386-25 is rated for 25 MHz, 80386-20 for 20 MHz, and so on. If you own a clone, it's not a bad idea to check the CPU to make sure what you bought was what was advertised. If it's not, don't be the least bit shy about sending it back for a refund.



PHOTOGRAPH: COURTESY OF INTEL CORPORATION

Figure 1: Intel CPUs are stamped with the rated clock speed (in MHz) following the number designating the type of CPU. This picture is of a 25-MHz 80386.

- CHECKING UNDER THE HOOD: Is the CPU in your machine the one you thought you bought?
- HARD DISK PROBLEMS: Avoid DOS's "Sector not found" message by periodically low-level formatting your hard disk.

HARD DISK PROBLEMS

Is it necessary to reformat a hard disk periodically? If so, why? Do hard disks have a problem retaining data over long periods of time?

Tim Merrill
Gainesville, Florida

PC MAGAZINE It is a good idea to reformat hard disks periodically. Not the high-level format DOS does, but a low-level format like the one that was probably done at the factory before your hard disk was shipped.

It isn't so much a matter of the magnetic media losing data. It eventually will, but with the retentivity (a measurement of how long magnetic media retains data) of today's hard disks, it would probably be many years before the effects of signal deterioration became noticeable. The reasons for reformatting have more to do with what happens to a hard disk over time as a result of normal, everyday use.

One of your hard disk's worst enemies is *drive alignment drift*, the tendency all drive heads exhibit to drift out of alignment as a result of mechanical wear and tear. As the heads creep, the radial position of sectors of data they write to the disk creeps also, but the sector ID headers, which lie between sectors, remain in the same positions.

These headers, which contain information the controller uses to locate sectors on the disk, are placed on the disk by the low-level formatting software. If the heads drift too far out of alignment, the controller may not be able to find the sector IDs. And if it can't find the sector IDs, it won't be able to locate sectors on the disk, either. When this happens, the controller flashes a message back to DOS that the read or write request failed. DOS responds with a "Sector not found" message and leaves you to your own devices to try to get at the data.

The effect of alignment drift is illustrated in Figure 2. The portion of the sector where data is stored is skewed, with respect to the sector ID headers, which remain where they were when the disk was last initialized. A new low-level format eliminates small alignment errors by rewriting the sector ID headers so that they line up with the sectors themselves, effectively calibrating the drive to compensate for drift.

Some drives are more resistant to alignment drift than others. Drives that use stepper motors to actuate the drive heads rely on mechanical precision to achieve repeatability in positioning the heads. When the head is told to seek a given track, the

stepper motor steps the head in or out a given distance and the controller assumes that the head is positioned correctly. This is called *open-loop* operation. *Closed-loop* actuators, however, use feedback from tracks stored on one side of one drive platter to position the drive heads (that's why some drives have an odd number of heads; the extra one is used for positioning, not for reading or writing data). These drives are somewhat less susceptible to alignment drift, because of this built-in ability to correct for small alignment errors. But even closed-loop actuators can't account for differential creep between the individual heads in a head cluster, while a new low-level format can.

It's also important to scan a disk for surface defects every now and then. Before a drive leaves the manufacturer, it's submitted to a thorough surface analysis, and bad sectors are marked off so that they won't be used. A list of bad sectors usually accompanies the drive out the door, so you can supply them to the formatting program, should you low-level format the drive later on. But more defects can develop over time. That's why it's equally important not to use just any low-level formatting utility, but one that submits the disk to a thorough read/write check as it does the formatting. Gibson Research (714-830-2200), makers of one such utility, *SpinRite II*, recommends that this test-and-format process be repeated every three months to keep drives free from defects and alignment-related problems.

There are plenty of other ills that can befall a hard disk as a result of normal use, many of which can be minimized (or averted altogether) by parking your hard disk's heads before you turn the power off. One problem is the damage the head inflicts on the disk's magnetic surface during takeoff and landing. Another is that the current that escapes the drive-head amplifiers when power is first applied is turned into magnetic impulses by the heads.

Yet another is a phenomenon endemic to stepper motor drives, where the heads are jerked violently sideways when power is applied—the result of randomly directed magnetic fields in the actuator coils. If you think this sounds like a formula for disaster, you're exactly right. That's why parking the heads is so important: Parking moves the heads over a landing zone—an area of the disk away from the data sectors—so that if surface damage does occur, no data will be lost as a result.

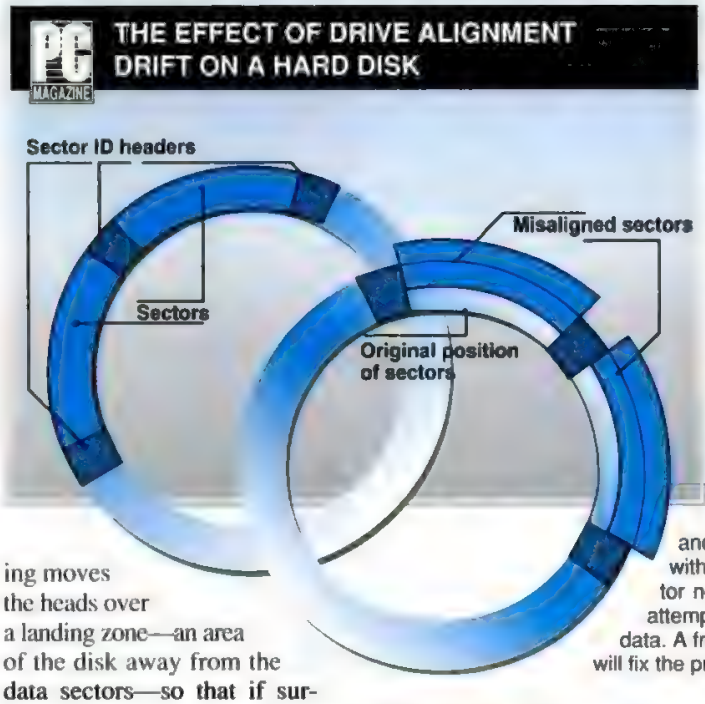


Figure 2: The sector ID headers, which the controller uses to locate sectors on the disk, stay where they were when the disk was last low-level formatted. The sectors themselves, however, drift slightly as a result of mechanical creep in the drive head mechanism. If this misalignment becomes severe enough, the drive controller won't be able to find the sector ID headers and DOS will respond with the message "Sector not found" when you attempt to read or write data. A fresh low-level format will fix the problem.

Over time, not parking the heads may result in damaged data sectors, damaged sector ID headers, or the development of new surface defects. A new low-level format will repair damaged ID headers. And a utility that tests for defects as it formats the disk will take care of surface defects by marking them so that data won't be stored there. If data sectors are damaged, however, your best defense is a good backup.

Modern hard disks and controllers possess the capability to correct small errors in reading data from disks using *Error Correction Codes*, or ECCs, which are stored on-disk alongside the data that makes up the sectors. But most ECCs can handle only 11 damaged bits of data per sector, and then only if the bits are contiguous. That's all the more reason to head problems off at the pass by reformatting the drive at regular intervals.

Interestingly enough, DOS can aggravate developing defect problems by not warning you that they're occurring. When the controller has to fix up data read from the disk using an ECC, the controller notifies the BIOS, and the BIOS notifies DOS that a fix-up occurred. What does DOS do? In an effort to be a good neighbor, it politely proceeds with business, not even pausing to warn you of a potentially dangerous condition on your hard disk.

If the problem becomes too big for the ECC to handle, DOS will finally tell you the sector is bad—but not before the part of the file stored in the affected sector or sectors becomes unrecoverable by conventional means.

Low-level formatting doesn't have to be a chore. There are several disk maintenance utilities that perform low-level formats nondestructively, leaving the data already on the disk intact.

SpinRite II is one; the *Norton Utilities* 5.0 is another. These programs also help you get the most out of your hard disk by testing for the optimum sector interleave (the physical separation of logical sectors on the disk to match the disk's speed of rotation to the rate at which the controller processes data) and applying the new interleave value while it low-level formats your disk. Despite the nondestructive nature of these programs, it's prudent to back up your hard disk before using them. The wide variety of drives and controllers available precludes the possibility that any program of this nature can work flawlessly on every combination of drive and controller.

ASK THE TUTOR

The Tutor explains techniques for using your hardware and software more productively. Questions about DOS and systems in general are answered here. To have your questions answered, write to Tutor, *PC Magazine*, One Park Avenue, New York, NY 10016, or upload them to PC MagNet (see page 8 for access instructions). We're sorry, but we're unable to answer questions individually. ■

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V.32 Smorgasbord

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by
Frank J. Derfler, Jr.

Connectivity

MICRO CHANNEL MACHINES

I really enjoyed your feature on "Bus Wars" in the June 26, 1990, issue. After hours of debate, our company decided to standardize on Micro Channel architecture, but IBM doesn't offer a high-powered LAN server. We want to deal with a large company that offers good support and especially one that will be around for a long time. Can you recommend another Micro Channel computer vendor?

Marty Metcalf
Salt Lake City, Utah

PC MAGAZINE Our favorite Micro Channel computers come from NCR. This very well established company offers quite a wide range of Micro Channel machines, including 386SX desktops, multiprocessor floor-standing servers, and parallel-processing muscle machines based on Intel i386/i486 architecture.

In the PC Magazine LAN Labs we use the NCR PC486/MC33 as a high-performance OS/2 workstation and the NCR S486/MC33 as a *LAN Manager* 2.0 network server. Both of these machines can carry up to 64MB of RAM, and the server houses 5GB of disk storage. The ability to hold more than 16MB of RAM will become more important when Microsoft delivers a version of OS/2 with 32-bit addressing. Just loading a database server program and *LAN Manager* in the file server can eat more than the 16MB of RAM in many PCs.

The hard disk drives on these NCR machines are some of the fastest we've seen. The secret to their speed is a proprietary interface to their high-performance SCSI adapter.

NCR resells OS/2 and *LAN Manager* from Microsoft, so it can provide you with a full range of products and support.

MORE ON TWISTED-PAIR WIRING

I don't understand a comment you made in the September 25, 1990, Connectivity column. You warned that on a Token-Ring network using unshielded twisted-pair (UTP) wiring, the entire network will go down if any of the four wires going to any single workstation develops a bad connection. But UTP Token-Ring networks use the same phantom-voltage protection and the same multistation access units (MAUs) with bypass relays that shielded twisted-pair (STP) rings use.

The only place where a single wire break can bring down the ring is on the main ring path (Ring Out to Ring In). This is a problem for both STP and UTP systems, and it can be avoided by using copper or fiber repeaters (IBM Models 8218, 8219, and 8220) or by using certain non-IBM MAUs that provide phantom-voltage protection on the main ring.

The main disadvantages of unshielded twisted-pair wiring are that it allows fewer stations per ring and a shorter ring length. The advantage is that it can be used for many different types of network connections, such as 10BaseT, ARCnet, and RS-423, whereas STP is typically used only for IBM products.

Mitchell Shnier
Toronto, Ontario Canada

- MICRO CHANNEL MACHINES: There's a good alternative to IBM for buying Micro Channel PCs.
- MORE ON TWISTED-PAIR WIRING: There are many variables to consider before using unshielded twisted-pair wiring for a Token-Ring network.
- IN-HOUSE TRAINING: Learn at your own pace with videotape and computer courses.

PC MAGAZINE My negative comments about the use of unshielded twisted-pair for Token-Ring wiring created quite a stir. Many readers did confirm that unshielded twisted-pair wiring previously installed for a PBX seldom provides reliable service for Token-Ring networks, particularly if the wiring uses the older "type 66" punch-down blocks.

On the other hand, as Mr. Schnier points out, my column was not entirely correct. And because the folks at Proteon make some of the most innovative products for Token-Ring, I took a dose of their strong medicine along with some tutoring about the reliability of the Token-Ring architecture. Similarly, technical people at Thomas-Conrad Corp. and IBM called to set me straight.

Phantom voltage is a voltage differential maintained between the transmit and receive wire pairs in a Token-Ring system. It exists in networks using either shielded or unshielded wiring. The 5-volt differential between the receive and transmit pairs activates the relay in the wiring hub or MAU that connects a node into the ring. If any wire between a node and the MAU breaks or shorts, the voltage differential disappears, the relay opens, and the ring carries on. So I was mistaken when I said that one broken wire could bring down the entire ring.

However, there are still many caveats for those who want to use unshielded twisted-pair wiring for a Token-Ring network—particularly in 16-megabit-per-second systems. Keep in mind that many of the variables—the number of nodes on the ring, the type of wiring, the signaling speed, and the wiring distance—are interdependent. A 4-megabit Token-Ring system can allow as many as 260 nodes to use as much as 100 meters each of shielded twisted-pair wiring to reach the MAU. But a 16-megabit system will have problems carrying the traffic for 70 nodes that use 80 to 85 meters of unshielded twisted-pair wiring each. These numbers are for ideal wiring systems, and most in-

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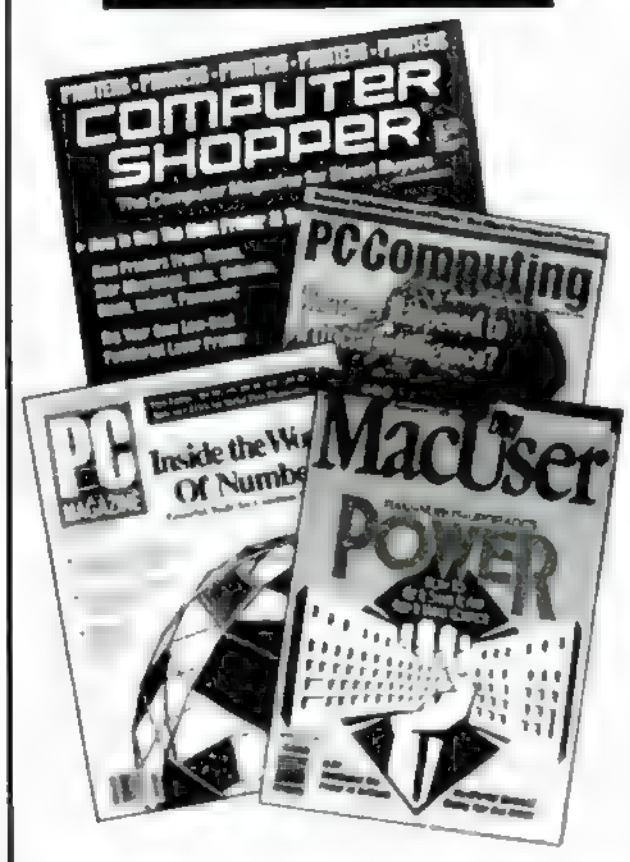

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Connectivity

stallations are by no means ideal.

The distance/station-count/cable/speed curves are complex. You must be particularly wary when you expand the ring to add new nodes. As each node enters the ring in the course of daily operations, the overall characteristics of the ring change. One station entering the network can turn out to be the straw that breaks the camel's back.

When you install unshielded twisted-pair wiring, you need to practice strict wiring discipline. The twists have to be kept tight through all the connections, to maintain the impedance of the wires. You can't allow any wire stubs or unterminated leads on the punch-down block to act as antennas for electrical noise, and you must avoid putting any other types of wire in parallel with the network cable. Several of the companies I talked to also cautioned against using the 25-pair wire bundles common in telephone systems.

The bottom line is this: Don't assume that the unshielded twisted-pair wiring already in your walls will work.

Other recommendations include using AT&T's Premise Distribution System as a wiring architecture and paying very close attention to the type of wire used in the system. As reader Evan Gamblin phrased it in his MCI Mail message, "Anyone who thinks UTP is all the same stuff, in terms of attenuation and cross talk, is in for a short career. There is at least a 100 percent difference in attenuation per meter between the best cable and generic Type 3 cable. When you design the network wiring, you must take the maximum allowable round-trip loss for the card, develop an attenuation plot for the cable, apply your own margin for safety, and draw your own conclusions." Some vendors recommend using what the industry calls Level 4 unshielded twisted-pair products, such as AT&T's Systimax, for best results in wire runs of over 50 meters.

So the bottom line is this: Don't assume that the unshielded twisted-pair wiring already in your walls will work for 10BaseT, ARCnet, or Token-Ring networks. Using unshielded twisted-pair wire in 10BaseT adds the reliability of a star wiring topology, which you don't get with thick or thin Ethernet, but I'm not yet convinced of its value in Token-Ring network installations.

IN-HOUSE TRAINING

First I was given the job of network supervisor. I arranged my own training and I think I know what I'm doing. Now I'm faced with the twin challenges of establishing an IBM SNA mainframe gateway and introducing *Microsoft Windows* onto networked PCs. Do you know of any videotape or computer-aided training systems in these areas?

Dale Lawrence
Detroit, Michigan

PC MAGAZINE We've found two courses that might be useful. The Saratoga Group offers the *SNA Desktop Seminar*, a self-paced, interactive, on-line system that teaches SNA using graphics, diagrams, and a question-and-answer format. The package includes an on-line quick-reference guide. At $695, this course makes a useful and economical addition to any organization's training library.

Microsoft sells an excellent training system for *Windows* users and programmers that includes videotape and programs. Our LAN Labs crew has been through the course and we found it easy to move through the information we already knew and to concentrate on what we wanted to learn. The entire *Windows* 3.0 training video retails for $2,995 and workbook materials for additional students are $249 each. An update kit for registered owners of the *Windows* 2.*x* video course is $495.

NETWORK YOUR QUESTIONS

Connectivity gives you practical solutions to networking problems of all types. We'll pay $50 for any tip we print. Please submit your letter on a disk along with a printout. Then mail your contributions to Connectivity, *PC Magazine*, One Park Avenue, New York, NY 10016, or you may contact Frank J. Derfler, Jr., via MCI Mail (be sure to use Derfler's box named PC MAGAZINE LAN LABS). We are unable to answer letters individually. ■

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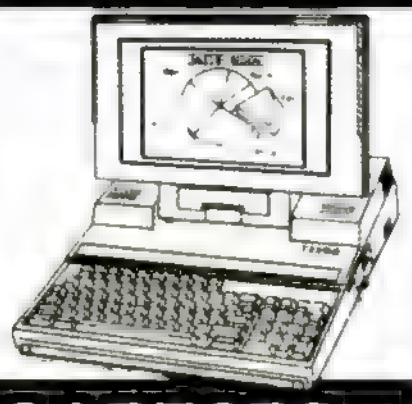

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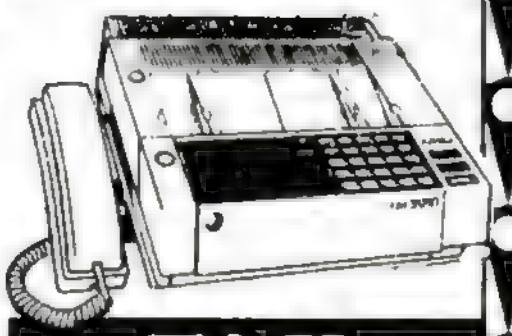

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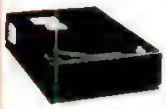

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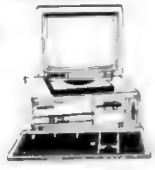

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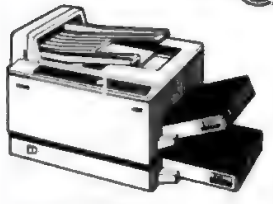

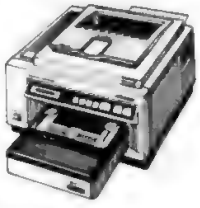

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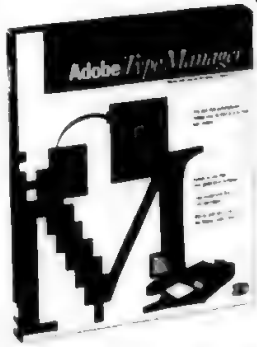

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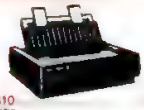

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FastData Systems

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Combine the benefits of an advanced Intel 386 processor, the value of a 286 and the advantages of FastData and you've got the FastData 386/SX! This machine is the choice of those who want to run today's powerful 386 and multitasking software, like Windows, and want to rip through their favorite programs, like Lotus and WordPerfect at blinding speeds. This machine is ideal to run the latest memory demanding and graphic software, right out of the box. We've made our customers' favorite options standard: it comes with an ample two megabytes of memory, a high performance 40mb hard drive, and 16 bit color VGA. Compare performance, features, and service and you will find no better SX value. Interested further? Try the FastData 386/SX for 30 days; you have to be happy - if not, we'll take it back.

Standard Features

- ✓ 16mhz Intel 80386-SX processor. (20mhz optional)
- ✓ 2 megabytes of zero wait-state RAM.
- ✓ 40 mb 28ms IDE hard disk, 1:1 interleave.
- ✓ 1.2mb 5.25" or 1.44mb 3.5" floppy drive. (Second drive add $79)
- ✓ Standard chassis with keylock, speed and reset buttons. (Optional chassis add $50)
- ✓ Five available drive bays.
- ✓ 200 watt power supply
- ✓ 14" VGA color monitor with 16 bit VGA card with 256K.
- ✓ Clock calendar, parallel port, and two serial ports. (Game port included on color systems)
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 available.
- ✓ 80387-SX coprocessor socket.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add $99.
- ✓ Compatible with DOS, OS/2, Windows, Xenix and Novell.
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System Price	40mb	65mb	80mb	100mb
Monochrome	$1,199	$1,269	$1,399	$1,469
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- ✓ Standard chassis with keylock, speed and reset buttons.
- ✓ Five available drive bays.
- ✓ 80387-DX coprocessor socket.
- ✓ 200 watt power supply
- ✓ 14" Super VGA color monitor, 1024x768 resolution, with 16 bit VGA card with 512K.
- ✓ Clock calendar, parallel port, and two serial ports. (Game port included on color systems)
- ✓ Keytronics 101 key keyboard.
- ✓ 8 expansion slots, 5 available.
- ✓ Full Shadow RAM and LIM 4.0 EMS support.
- ✓ Windows & Mouse add $99.
- ✓ Compatible with DOS, OS/2, Windows, Xenix and Novell.
- ✓ FCC Class B approved.

System Price	65mb	80mb	100mb	200mb
Monochrome	$1,699	$1,829	$1,899	$2,299
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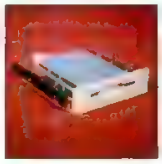

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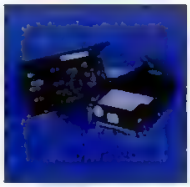

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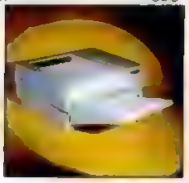

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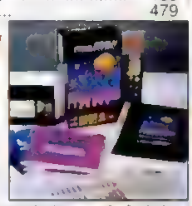

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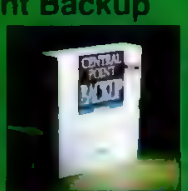

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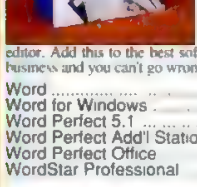

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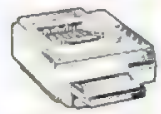

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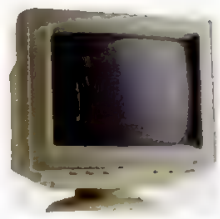

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256K x 9 – 08	18
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2MB	$190
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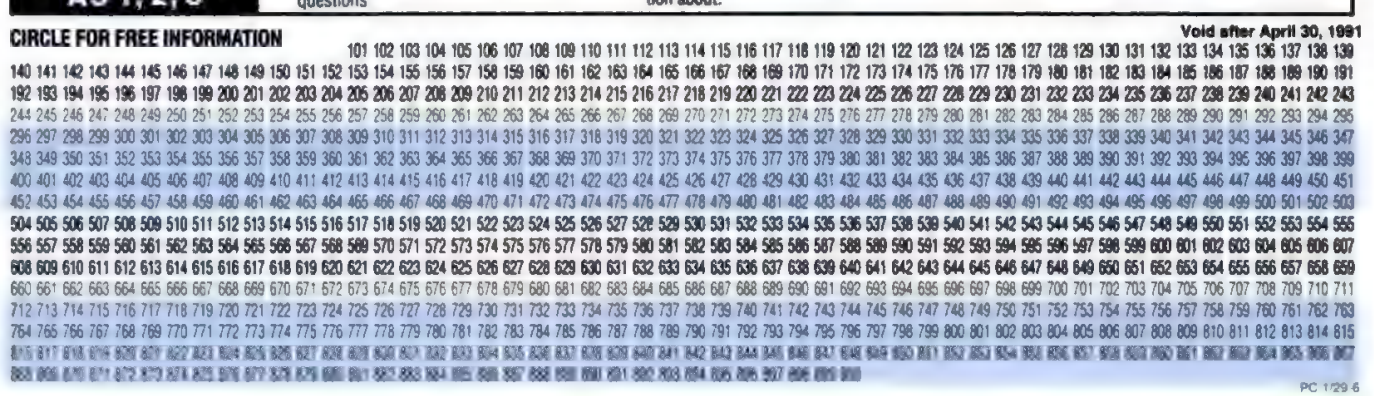

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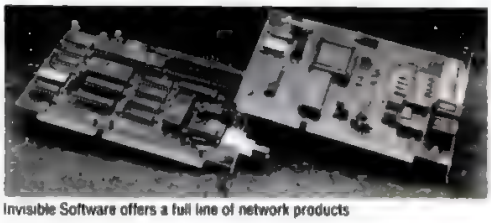

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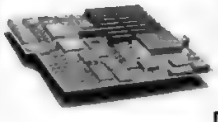

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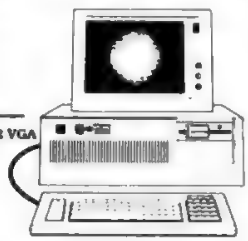

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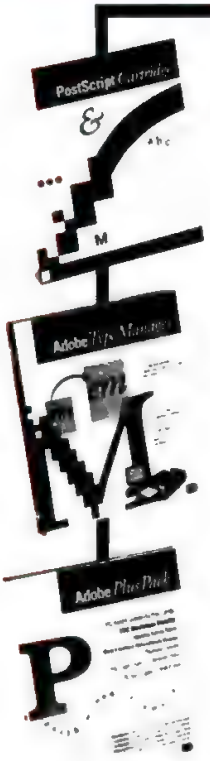

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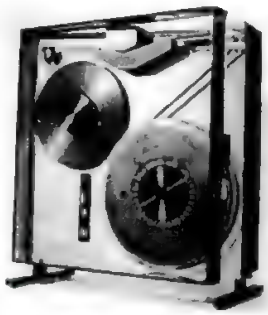

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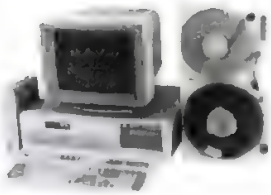

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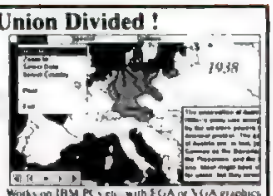

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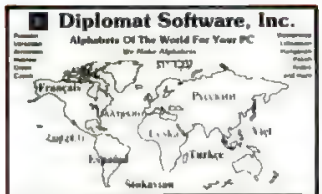

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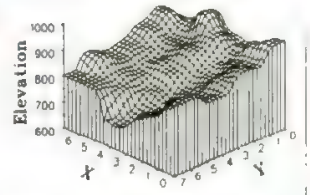

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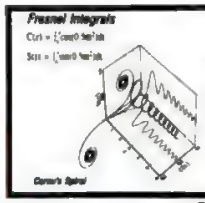

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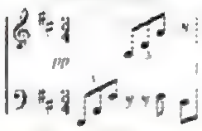

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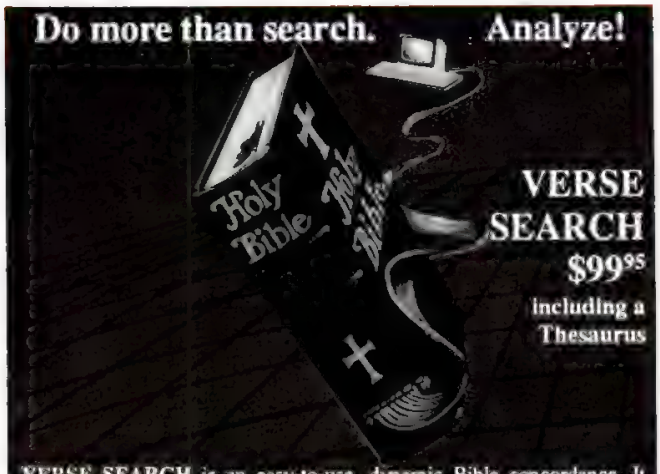

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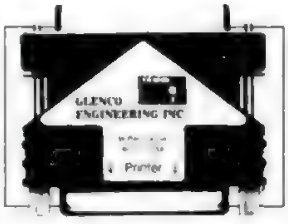

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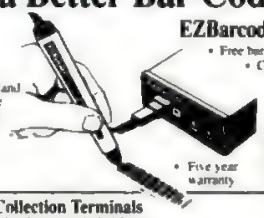

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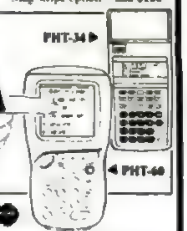

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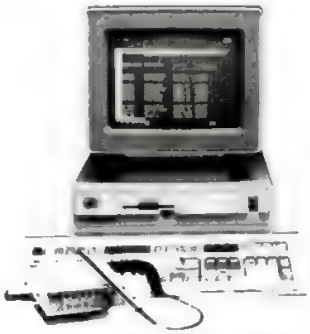

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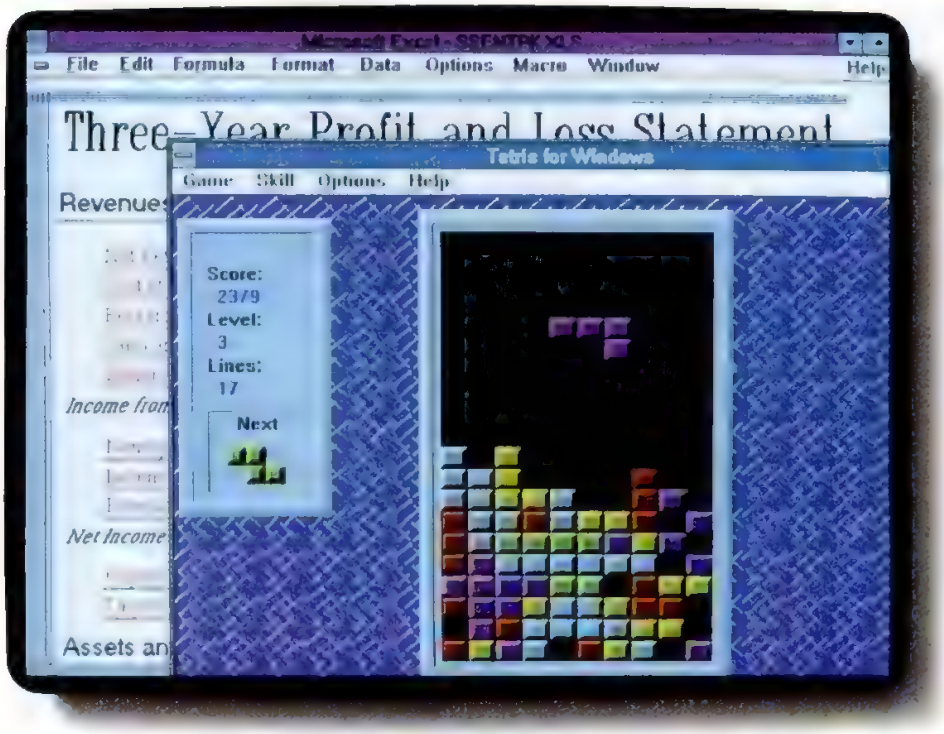

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For more information, call (800) 541-1261, Dept. P12. Customers in Canada, call (416) 673-7638. Outside North America, call (206) 936-8661. ©1990 Microsoft Corporation. All rights reserved. Microsoft and the Microsoft logo are registered trademarks and Making it all make sense and Windows are trademarks of Microsoft Corporation. TETRIS is a trademark of V/O Electronorgtechnica (Elorg). All Rights Reserved. If you've read all the way to this sentence, you obviously have enough spare time to really enjoy the Entertainment Pack.

After Hours

Products for the Leisure Side of Personal Computing

The Note Processor: Flexible Data Entry Yields Attractive Musical Output

MUSIC
by Rick Bassett

At first glance, the ideal user interface for a music printing program would seem to be a graphically represented sheet of music paper. A mouse could be used to place notes on the staves in the same way that the musician uses a pencil. But the wide variety of music symbols, and the elaborate yet flexible rules that govern their use, could easily turn such a program into a jumble of menus, palettes, and hidden features. There is always a conflict between the musician's desire to put a symbol anywhere at anytime, and the computer's need to know the symbol's function, so that it can manipulate the music in meaningful ways.

The Note Processor, from Thoughtprocessors, attempts to get around some of these problems by making less use of a graphics-based music screen interface, in favor of more indirect control. You can enter music into *The Note Processor* in three ways. You can use a mouse in the graphics screen editor, record music from a MIDI keyboard, or type it in using a text-based language called DARMS.

DARMS (Digital Alternate Representation of Musical Scores) represents music in a kind of ASCII shorthand that compactly stores even complex musical rhythms and counterpoints.

The graphics screen editor, DARMS screen, and MIDI screens each store different kinds of musical information, and each has its own file format. You can convert MIDI files and DARMS files back and forth for ease of editing. Both types of files can be converted at any time to Page files, which show you how the music will look on paper. Page files primarily consist of graphics information, and cannot be converted back to DARMS or MIDI format. Consequently, you should get all DARMS and MIDI editing done before attempting any real editing in the screen editor.

You might start a typical project by using a MIDI keyboard to record some tracks on the MIDI screen. You could then convert the tracks to DARMS for editing and the addition of text and symbols. Next you would convert each instrumental part to an Instrument file, and then to a Page file for the graphics screen editor. Finally, the parts would be combined to make a Page file of the complete score. It takes a bit of bookkeeping to keep track of all these files, plus, of course, clever planning of the eight-plus-three-character DOS filenames!

The Note Processor's MIDI screen uses a basic 8-track sequencer to record parts played on a MIDI keyboard. The sequencer is not full-featured, and is provided simply as a means to record tracks. *The Note Processor* reads and writes standard MIDI files, however, and can share files with more powerful music sequencing programs. You can set the Duration Mode to determine whether *The Note Processor* rounds off each track to the nearest 8th note, 16th note, or other value.

You can't edit tracks on the MIDI screen; they must be converted to DARMS or graphics files for further refinement. The MIDI screen can load and save multiple MIDI files, so you can hear up to eight parts at once, without waiting for the conversion to the final score.

DARMS is at the heart of *The Note Processor*. Unless you simply want to record a few tracks and print them out with very little editing, you need to use DARMS. Since DARMS is made up of standard ASCII text, you can use all the functions of your favorite word processor to edit your music. Your word processor, however, must be able to store the file as straight ASCII text for the DARMS files to be read correctly. *The Note Processor* can fit most word processing programs within its DOS shell, for quick access to your editor.

***The Note Processor*'s screen editor is a true WYSIWYG display. Note the palette of icons along the bottom edge.**

The Note Processor uses standard music engraving rules to convert DARMS and MIDI code files into graphics Page files. If you wish, you can override many of the automatic rules by choosing among three "verbosity" modes. In the higher verbosity modes, the program prompts you for more data, such as page size, margins, and how many measures should be in each line. Special spacing and symbol codes can be entered into DARMS for interpretation of complex and nonstandard contemporary scores, music with no meter, or musical analysis charts.

After using MIDI and DARMS, you can further refine your music in the screen editor. The screen editor is a true WYSIWYG graphics display with a palette of symbols and commands at the bottom. The screen editor has no cut-and-paste or large-scale block editing functions, since it is assumed that this kind of editing will be

CONTINUES

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Music Box gives your CD-ROM drive the gift of music.

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The Note Processor

CONTINUED

done in DARMS. Symbols can simply be inserted, deleted, or moved one at a time. While anything can be inserted from the screen editor, it is best used for adding slurs, dynamic markings, accents, and any other fine details. The screen can zoom in at five different magnifications that vary from 100 percent to 16 percent, so you can check the overall look of the page, or perhaps add a staccato dot at just the right place.

There is a waiting time of 1 to 3 seconds (on a 286 machine) for nearly any operation in the screen editor. The wait seems reasonable, given all the graphics number crunching, but it can make entering music by hand a very long process. Noteheads, stems, and beams are all entered separately. While you can use the mouse to place symbols very precisely, it often takes several attempts to connect the stems and beams just right. For moving more than a couple of notes around, it's better to make the changes back in DARMS and reconvert the file. Here the advantage of *The Note Processor*'s unusual data input techniques becomes apparent. The graphical screen editor affords the convenience of WYSIWYG, while DARMS offers a mercifully quick way to enter information.

Since scrolling the screen also involves a time lag, it would be nice to be able to scroll more than just one staff at a time. This limitation is not really too much of a problem if you are methodically entering the music from a score, but obviously makes it more difficult to jump around the score.

The proof of the program, however, is in the printing. 300-dot-per-inch output from an HP LaserJet looks particularly excellent, and 24-pin dot matrix printing is very readable. Slurs and crescendo marks look particularly graceful. A variety of music and text fonts and sizes are available, and you can use any HP compatible text soft font when printing with a LaserJet. Files can also be saved in .TIFF graphics format for use with some word processors and desktop publishing programs.

The Note Processor is probably not the program for someone with little knowledge of music notation. But for those with a reasonable knowledge of notation and a willingness to work a little bit with DARMS, *The Note Processor* is an affordable way to print out some very good-looking music.

List Price: *The Note Processor*, Version 2.1, Release 1, $295.
Requires: 640K RAM; graphics adapter; DOS 3.2 or later; supported printer. Mouse and hard disk strongly recommended. Roland MPU-401 MIDI Interface or compatible plus any MIDI keyboard for MIDI input.
Thoughtprocessors, 584 Bergen St., Brooklyn, NY 11238; (718) 857-2860.

CIRCLE 427 ON READER SERVICE CARD

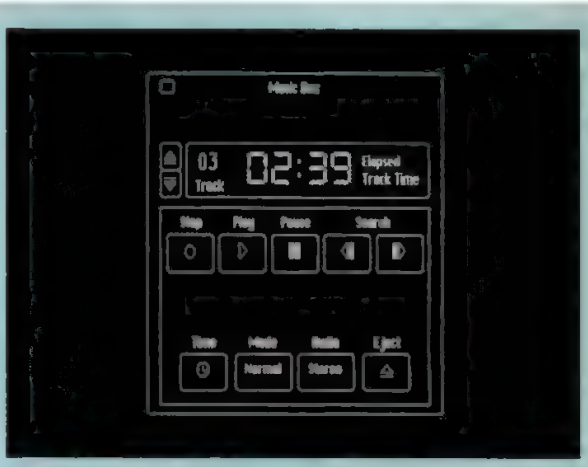
Utility Coaxes CD-Audio Out of Your ROM Drive

Colleagues lured into my office by the show tunes blasting from within do a double-take when they discover that the source of the Sondheim is my CD-ROM drive. They are surprised to learn that you can do pretty much anything with an audio-capable CD-ROM drive that you can do with its glitzier, audio-only sister—provided that you have the proper software to control the unit's operation. You simply hook up the CD-ROM to headphones, powered speakers, or a receiver, and the same drive that holds gobs of data can fill your office with music.

Trantor Systems, a hardware company that OEMs interface cards for many popular CD-ROM drives (such as NEC's), offers *Music Box*, a $59 utility that controls playback of audio CDs on CD-ROM drives. *Music Box* adds many of the comforts and conveniences of your home CD player to your ROM drive. In addition to merely letting you play a CD straight through, the software allows you to choose a desired track, randomly shuffle tracks, repeat an entire disk, search forward and backward, pause a track, and select audio channels (left, right, both, and mono). It displays a digital readout of time remaining on a disk, time remaining on a track, elapsed track time, or elapsed CD time.

In its nonresident mode, *Music Box* displays a control panel with all the familiar "buttons" from an audio-only player: you choose a command by clicking on the button with the mouse or typing a mnemonic letter. Hitting the Esc key terminates the program (since CD-ROM players essentially run audio in the background, exiting the program does not terminate play.) So you can start a disk playing, then Esc out of *Music Box* and go on to word processing or number crunching with the added perk of a musical soundtrack.

Music Box also runs as a TSR, in either of two modes. The first runs the program as described above, but remains in memory. Alternatively, you can run blind; all the commands are the same, but you merely type letters without any visual feedback, only beeps to tell you that a command was issued. Running this way can be disorienting, but it minimizes the problems caused by popping up a graphics screen over character-based applications. *Music Box* takes approximately 18K when resident.



***Music Box*'s mousable control panel offers most of the familiar features of an audio-only player. Track programmability would be a welcome additional capability.**

While useful, *Music Box* lacks some features that would greatly enhance its value. The most important omission is the ability to program the playing sequence. And I, for one, am impatiently awaiting a version which fully supports *Windows* 3.0, a version which is being held up pending the release of a *Windows* 3.0-supporting version of the Microsoft Extensions. The current release can only run under *Windows* 3.0 in real mode.

If all you want to do is play your CDs straight through, then the utility provided with your CD-ROM drive will probably continue to suit your needs. But if you'd like to take advantage of the capabilities available with your audio-only CD player, *Music Box* is worth the $59.

List Price: *Music Box*, $59.
Requires: CD-ROM drive with audio output capability, Microsoft CD-ROM Extensions 2.1 or later, graphics adapter.
Trantor Systems, 5415 Randall Pl., Freemont CA 94538; (415) 770-1400.

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The Grand Sweep Of U.S. History On a Single CD-ROM

CD-ROM
by Don Trivette

Take one hundred books on United States history and copy them onto a single CD-ROM and you've got—what else?—Bureau Development's *U.S. History on CD-ROM*. This is a collection any history buff would drool over and one that's indispensable for those building CD-ROM reference libraries.

USH's retrieval software (called the search engine by computer types) is so straightforward that you won't have to read the manual to read the books. Highlight "search," highlight "word," type a topic like "Bull Run," and you'll get a list of 17 chapters in ten books where information about the first major battle of the Civil War appears. In this case the sources include *Our Country* by Benson Lossing, the Interior Department's *Official National Park Guidebook*, *American Military History* edited by Matlog, *The Eagle's Talons* by Drew and Snow, and *A Century of Photographs* by Renata Shaw.

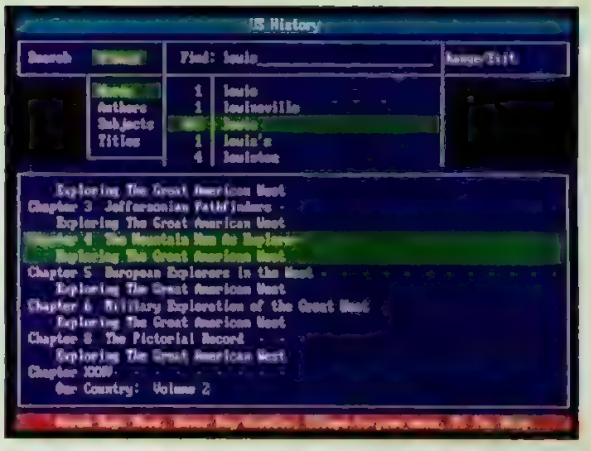
Scanning a list of the *USH*'s books, I found a variety of titles including *Air Force Heroes in Viet Nam*, *Appomattox Court House*, *Devil's Tower*, *Military Leadership of the North & South*, *NASA, the First 25 Years*, *United States History 1600-1987*, and *Wright Brothers*.

Wondering how broad *U.S. History* really is, I searched for a few of the obscure (and generally worthless) facts I've gleaned over years of reading history books and watching "Jeopardy." I'm disappointed to report that nowhere in the 100 books does it tell you the name of the cruiser (*Memphis*) that returned Charles Lindbergh to the United States after his solo flight. Nor does *USH* "know" anything about the New Madrid earthquakes (Missouri, 1811-1812) or Lewis and Clark's Indian guide (Sacagawea).

U.S. History on CD-ROM is strong on wars, government, and military history; it's weak on biographies, commerce, arts, and natural history. One of the most interesting books is *A Century of Photographs 1846-1946*, which contains a collection of photos by such noted shutterbugs as John Plumbe, Roger Fenton, and Matthew Brady. It takes a VGA card and monitor to view these images, and you'll need one of the newer VGAs with 512K of memory to get the full impact.

U.S. History on CD-ROM is a great research tool for libraries, schools, historians, and anyone who generally loves history, but for "Jeopardy" fans and trivia buffs it lacks depth. **List Price:** *U.S. History on CD-ROM*, $395. **Requires:** 640K RAM, CD-ROM drive, Microsoft Extensions 2.0 or later, DOS 3.1 or later; VGA card optional. Bureau Development Inc., 141 New Rd., Parsippany, NJ 07054; (800) 828-4766, (201) 808-2700.

CIRCLE 420 ON READER SERVICE CARD



With its simple, intuitive interface, *U.S. History On CD-ROM* gives you immediate access to a wealth of U.S. history texts.

YOUR CONSTITUTIONAL RIGHTS, RIGHT AT YOUR FINGERTIPS

by Don Trivette

Do you know what the First Amendment to the Constitution really says? Can you lay your hands on a copy of the Declaration of Independence? Have you ever seen your state's constitution?

Constitutional Papers on CD-ROM ($99), also from Bureau Development, is a perfect companion to the company's *U.S. History*. It contains the full text of "The Articles of Confederation," Thomas Paine's "Common Sense," all of the Federalist Papers, the Mayflower Compact, the "Pickney Plan," both Washington and Jefferson's first inaugural addresses, the Monroe Doctrine, and dozens of other primary sources often cited, but not often found, in history books.

Although *Papers* search software can pull up a specific document like the Declaration of Independence or search for a key word or phrase like "We the people," it is not as intuitive to use as the *USH* search engine. But the software's biggest flaw is that it has no means to print a document other than the hopelessly feeble hardware Print Screen method. Nor are the documents in a format readable by a text editor or word processing program.

Even with the glaring omission of a print command, the *Constitutional Papers* is a handy source for the stuff from which U.S. history was made. ■

Ya Wanna Drag? Street Rod Puts You in a Muscle Car

Miss the Muscle Cars of the Sixties? How about Classic Fifties Iron? Do you pine for the era when engines were unbridled beasts and mufflers were replaced by headers and dual exhausts? Whether you were too young or just too dirt poor to enjoy the feeling, you have a second chance to own a *Street Rod* for only $39.95 thanks to the gear heads at California Dreams. The game is distributed by Electronic Arts as part of their affiliated labels program.

You begin with a $750 bankroll and a newspaper. Peruse the used car ads and pick your poison, but don't expect to get cherry iron for such a pauper's payment. You'll find Chevys, Chryslers, and Fords that range from tired grocery-getters to all-out street racers with fat-rat motors, but you're budgeted for the bottom of the pile. Since you can't buy your way into street rodding, you will have to pay your dues and work your way up.

With your new ride sitting back in your garage, the conversion process from car to rod begins. A part of your remaining bankroll should go to stripping

CONTINUES

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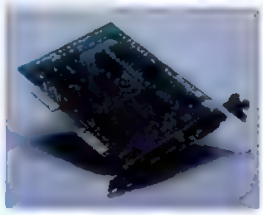

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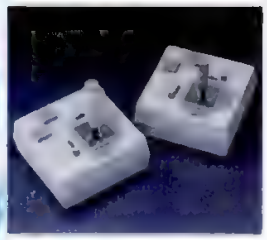

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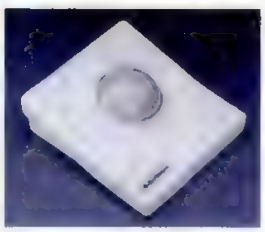

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After Hours

Street Rod

CONTINUED

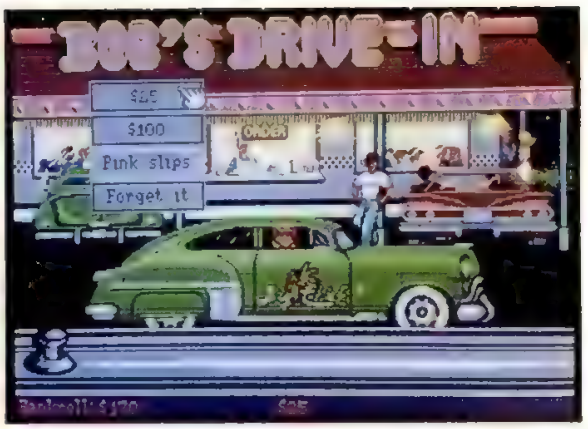
off the bumpers and chopping the hood. That will make your beast lighter and more aerodynamic and maybe give that pathetic collection of stock valves and cylinders a slight edge until something better comes along. Remember to save some money for gas.

When you're ready, hit the streets and cruise down to Bob's Drive-In (keep an eye out for the cute car hop!). A succession of eager marks will cruise by. You can challenge any of them, but be careful. Most of them will have cars that are similar in performance to yours, but there's a sleeper in every crowd. If you elect to run a drag race you can do so for money or fun, but what's the fun when no money's involved? Road racing is also an option, and it adds the allure of running for "pink slips" (winner gets the loser's car).

That's the crux of the game. Make money to buy better parts or cars, or win better cars and make them even better if you're up to it. Whether you're building, buying, or selling, the object is to get time behind the wheel and the most bitchin' ride possible because the ultimate goal in *Street Rod* is to beat the king and his killer black '63 'Vette. All you'll need is some confidence and some skill, but you only have the summer months during which to accomplish your mission.

There are a few disappointments in *Street Rod*. Die-hard Chrysler fans will note the glaring omission of the 383 CID or any of the 400 series RB blocks despite the inclusion of the newer (and somewhat less potent) 340 A block. Likewise, there's no way to tuck a pair of fat slicks under the rear while keeping relatively narrow street tires up front. But this is a game, and not a simulation, so it's easy to dismiss these small incongruities.

The police will ticket you when you drive fast; you can blow an engine or drop your tranny; and most of your fellow rodders won't hesitate to try and bump you off the road during a race. But that's life, and it's a lot of fun. The only thing missing from *Street Rod* is a dirty rag and a burn mark on your arm from leaning against the headers. Not a bad trade-off at all! ■



One way to get a better ride in *Street Rod* is to win someone else's in a drag race. Just be careful who you challenge.

List Price: *Street Rod*, $39.95.
Requires: 512K RAM (640K for Tandy 16 color); DOS 2.0 or later; graphics adapter.
Electronic Arts, 1820 Gateway Dr., San Mateo, CA 94404; (800) 245-2545.

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COMING UP

■ LOTUS 1-2-3, RELEASE 3.1

Spreadsheet users confused by the flurry of updated *Lotus 1-2-3* releases can look at Release 3.1 as a development plateau for Lotus. All of Release 3's functionality is there, but so is a new graphical awareness that gives the venerable package a truly mouseable interface in the DOS environment for the first time.

■ DR DOS ALTERNATIVE

Digital Research's DR DOS 5.0 offers an alternative to MS-DOS. The advantages: a friendly interface and special coding that lets the software control your processor's energy consumption, making battery-powered portables run longer.

■ 33-MHz 486 PCs

The new muscle king is the 33-MHz 486 PC, proving that too much is never enough when it comes to speed and power. Especially useful in CAD, engineering, and math-intensive applications, Intel's 80486 chip offers built-in caching and coprocessing abilities. PC Labs investigates 30 of these fire breathers, some of the fastest machines money can buy.

Club Hawk IIITi

■ MATH COPROCESSORS

In today's world, CAD, complicated spreadsheets, and high-end graphics are becoming more and more commonplace. That's where math coprocessors come in. But what do math coprocessors *do*, and why do *you* need one? To help answer these questions, PC Labs evaluates four of these number-crunching chips, including Intel's 80387, Cyrix's 83D87 and 83C87, and IIT's 3C87.

■ EXTERNAL LAN ADAPTERS

Laptop users often face the challenge of connecting their portable PCs to a network. PC LAN Labs takes a look at external LAN adapters—products that attach to the serial port of a laptop or a regular PC and give it a LAN connection. Products that we look at in this feature include the Xircom Pocket LAN Adapter, D-Link Ethernet Pocket LAN Adapter, and IQ Technologies' p*LAN. ■

by Bill Howard

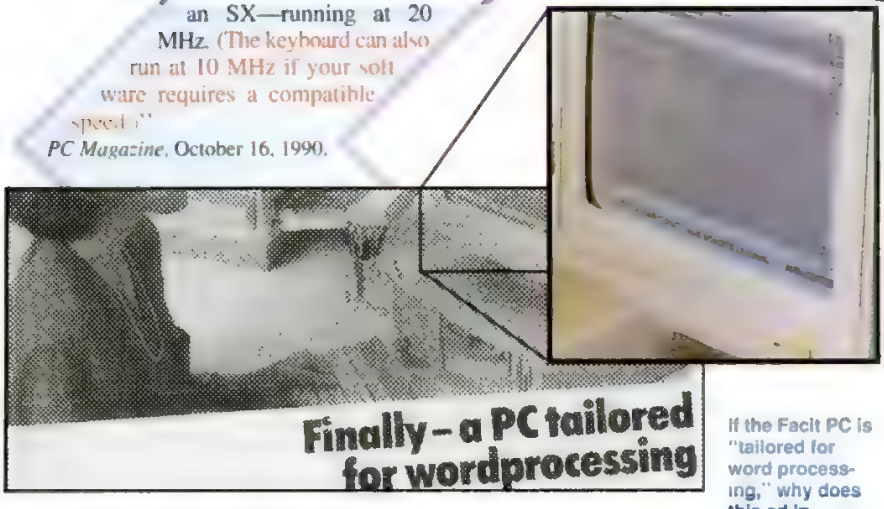
Abort, Retry, Fail?

The Lighter Side of Personal Computing

Mea Culpa

"At over 17 pounds, the Zenith TurbosPort 386e is hardly a lightweight tagalong. Still, this $7,499 portable offers real 32-bit computing power at a higher processing speed than some desktops. The 386e designation indicates that this TurbosPort is a real 80386—not an SX—running at 20 MHz. (The keyboard can also run at 10 MHz if your software requires a compatible speed.)"

PC Magazine, October 16, 1990.



If the Facit PC is "tailored for word processing," why does this ad in *Scanorama*—the SAS in-flight magazine—show a spreadsheet on-screen?

Funk Software promotion from a New York University Book Centers ad in the *Washington Square News*, Oct. 1, 1990.

Desperation: The Mark of Many Email Systems

"S380 MAILbus—What It Is and How to Implement It. This seminar will outline the fundamentals of what MAILbus is . . . features, benefits, components, and the products which comprise MAILbus. You will see how MAILbus fits into the Digital Network Architecture and the ISO Model. The seminar will follow a sample case study of how one company implemented MAILbus and integrated their desperate mail systems."

Seminar abstract, Digital Equipment Computer Users Society (DECUS), fall 1990 symposium

Take Your PICK

From the Peripherals chapter of the PICK Systems operating manual: "**SP-EDIT MD**—Force all selected print files to be deleted without passing go or collecting the traditional, if shrinking, 200 dollars. The process is breakable only between deletions."

If your entry is used in Abort, Retry, Fail? we'll send you $50 and a *PC Magazine* T-shirt. Caution: In case of multiple entries, the postmark date, neatness and completeness of entry are considered. Winners this issue: Flavio S. Machado (Facit spreadsheet), Lara J. Kisiel (pork on spreadsheets), Robert H. Tullman (desperate mail systems), Bill Fig (10MHz keyboard), George G. Girardello (PICK Systems).

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☐ 386-based systems ☐ Laptops
☐ 386SX-based systems ☐ Other: _____
☐ 486-based systems

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